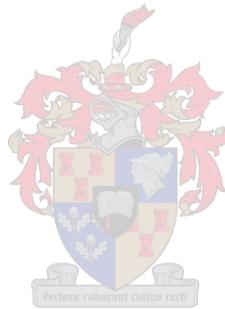


# **Towards an Ethically Founded Framework for Sustainability Engineering in South Africa**

by  
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Stellenbosch University

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## **DECLARATION**

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**ABSTRACT**

The apparent conflict between development activities and the need to preserve environmental integrity, here called the environmental dilemma, serves as the point of departure for this study. With engineers in general, and civil engineers in particular, being major role players in development activities, this study turns particular attention to the role they do, and should play with respect to the environmental dilemma.<sup>1</sup>

The study commences with an overview of the traditional ethical and environmental ethical theories, but this does not produce an unambiguous, master solution to the environmental dilemma. However, on a more pragmatic level, and based largely on its undeniable widespread popularity, the concept of *sustainable development* surfaces as the most promising strategy. Notwithstanding its popularity it remains a vague and contestable concept. This is born out by the numerous definitions and interpretations accorded to sustainable development in the literature. In order to lend more rigour to the concept, this study firstly suggests an ethical foundation for it, and secondly proposes a framework through which a fuller understanding of it may be articulated.

The ethical foundation is based on the value of *beneficence*, which is rooted in the reciprocal altruism that is part of our evolutionary heritage, and which has been further reinforced by widespread cultural appropriation. Moderated by the equally widely held value of *fairness*, and the principles of *holism* and *biocentrism*, it is argued that beneficence, as a basic and near universal societal value, is well suited to be the moral underpinning for sustainable development.

The sustainability framework, as it is proposed in this study, is hierarchically structured so that it is more monistic and prescriptive at its higher levels, while at the lower levels it is more pluralistic and pragmatic. At the highest level of the framework sustainable development is irrevocably bound to the *vision* of a sustainable society. At the next level the *values* that underpin sustainable development, beneficence, fairness and respect for life, are found. At the following levels the message of the vision and the values of sustainable development is expanded further through three *foundational* and eighteen *subsidiary principles*, the latter being expressed in categories that represent the *dimensions* of sustainable development. This study recognises four dimensions within sustainable development, these

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<sup>1</sup> It needs to be noted that in this study the *environment* is (frequently) broadly interpreted so as to include social concerns as well as those related to the natural environment.

being the *environmental*,<sup>2</sup> the *social*, the *economic* and the *institutional* dimensions. These dimensional categories are not mutually exclusive but are rather used as categories of convenience. The framework is concluded, at the lowest levels, with *measurement themes* and *applications*, also dimensionally categorised.

With this expanded understanding of sustainable development as background, the study proceeds to an overview of the legal and policy framework of South Africa with respect to the environment and sustainable development. This is followed by two case studies that attempt to discern the sustainability challenges evident in local development practice. The first of these case studies deals with the proliferation of golfing estate developments in the Southern Cape, and the second with the proposed construction of a national toll road through the Wild Coast area of the Transkei.

The study then turns its focus to the engineering profession in South Africa, with particular reference to the civil engineering discipline. After reviewing engineering codes of conduct from a number of countries, particularly with respect to their environmental and/or sustainability prescriptions, a proposal for a South African version of such a code is put forward. As it turns out this suggested code leans heavily on the previously proposed sustainability framework. Finally civil engineering education in South Africa is assessed with respect to environmental and/or sustainability requirements, and the conclusion is that sustainable development, in its fullest sense, might be best served by the introduction of a unique educational programme focussed specifically on *sustainability engineering*.

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<sup>2</sup> This is an instance where the environment is interpreted more narrowly as the *natural* environment.

## OPSOMMING

Die konflik wat skynbaar bestaan tussen ontwikkelingsaktiwiteite en die behoefte om die integriteit van die omgewing te bewaar, hier genoem die omgewingsdilemma, dien as die vertrekpunt van hierdie studie. In ag genome dat ingenieurs in die algemeen, en siviele ingenieurs in die besonder, hoofrolspelers is in ontwikkelingsaktiwiteite, word aandag hier spesifiek geskenk aan die rol wat hulle speel, en behoort te speel, met betrekking tot die omgewingsdilemma.<sup>3</sup>

Hierdie studie begin met 'n oorsig van die tradisionele teorieë in etiek en omgewingsetiek, maar dit lewer nie 'n eenduidige meester-oplossing vir die omgewingsdilemma nie. Egter op 'n meer pragmatiese vlak, en grootliks gebaseer op die onteenseglike populariteit van die konsep, het *volhoubare ontwikkeling* as 'n belowende strategie na vore gekom. Desnieteenstaande die hierdie populariteit, bly die konsep van volhoubare ontwikkeling vaag en omstrede. Die veelvuldige definisies en interpretasies wat in die literatuur aan die konsep toegesê word, dien as bewys hiervan. Om meer krag aan die konsep te verleen word daar in hierdie studie, eerstens 'n etiese fondament ter ondersteuning van volhoubare ontwikkeling, en tweedens 'n raamwerk waardeur dit beter verstaan kan word, voorgestel.

Die etiese fondament is gebaseer op die waarde van *welwillendheid*. Hierdie waarde is gewortel in die wederkerige altruïsme wat deel uitmaak van ons evolusionêre erfenis, en verder in die samelewing gevestig is deur wydverspreide kulturele toe-eiening. Daar word geredeneer dat welwillendheid, bemiddel deur die ewe wydonderskrewe waarde van *billikheid*, en die beginsels van *holisme* en *biosentrisme*, as 'n basiese en 'n byna universele maatskaplike waarde, besonder geskik is om vir volhoubare ontwikkeling die morele onderbou te wees.

Die volhoubaarheidsraamwerk, soos dit in hierdie studie voorgestel word, is hiërargies gestruktureer sodat die hoër vlakke meer monisties en voorskriftelik is, terwyl die laer vlakke meer pluralisties and pragmaties is. Op die hoogste vlak van die raamwerk word volhoubare ontwikkeling onlosmaaklik gekoppel aan die *visie* van 'n volhoubare gemeenskap. Op die volgende vlak word die *waardes* wat volhoubare ontwikkeling fundeer, naamlik welwillendheid, billikheid en respek vir lewe, gevind. In die daaropvolgende vlakke word die boodskap van die visie en die waardes van volhoubare

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<sup>3</sup> Daar moet kennis geneem word dat die *omgewing* in hierdie studie (dikwels) breed geïnterpreteer word, en dus sosiale kwessies sowel as dié van die natuurlike omgewing insluit.

ontwikkeling uitgebou deur drie *basiese* en agtien *aanvullende beginsels*, waarvan laasgenoemde uitgedruk word in kategorieë wat die *dimensies* van volhoubare ontwikkeling weergee. Hierdie studie onderskei vier dimensies in volhoubare ontwikkeling, naamlik die *omgewings-*,<sup>4</sup> die *sosiale*, die *ekonomiese* en die *institusionele* dimensies. Hierdie dimensionele kategorieë is nie onderling uitsluitend nie, maar word eerder as kategorieë van gerief aangewend. Die raamwerk word op sy laagste vlakke voltooi deur *metingstemas* en *toepassings* wat ook dimensioneel gekategoriseer is.

Met hierdie uitgebreide begrip van volhoubare ontwikkeling as agtergrond, is die studie voortgesit met 'n oorsig van die Suid-Afrikaanse wetlike en beleidsraamwerk ten opsigte van die omgewing en volhoubare ontwikkeling. Dit is opgevolg deur twee gevallestudies wat poog om die uitdagings wat volhoubaarheid in plaaslike ontwikkelingspraktyk hou, te skets. Die eerste van hierdie gevallestudies het die die vinnige vermeerdering van gholf-landgoedere in die Suid-Kaap aangespreek, terwyl die tweede gehandel het oor die voorgestelde konstruksie van 'n nasionale tolpad deur die Wildekus-area van die Transkei.

Die fokus van die studie verskuif hierna na die ingenieursprofessie in Suid-Afrika, met spesifieke verwysing na die siviele ingenieursdisipline. Nadat verskeie ingenieursgedragskodes van 'n aantal lande oorweeg is, veral met betrekking tot hul omgewings- en volhoubaarheidsvoorskrifte, is 'n Suid-Afrikaanse weergawe van so 'n gedragskode voorgestel. Uiteraard leun hierdie kode swaar op die volhoubaarheidsraamwerk wat vroeër voorgestel is. Ten laaste word siviele ingenieursopleiding in Suid-Afrika beoordeel ten opsigte van omgewings- en volhoubaarheidsvereistes, en die slotsom is dat volhoubare ontwikkeling, ten volste begryp, ten beste uitgebou sal kan word deur die instelling van 'n unieke opvoedingsprogram wat spesifiek gefokus is op *volhoubaarheids-ingenieurwese*.

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<sup>4</sup> Hier word die omgewing weer nouer ge-interpreteer, as die *natuurlike* omgewing.

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**ABBREVIATIONS AND ACRONYMS**

ACE	Association of Consulting Engineers
AEF	Africa Engineers Forum
ASCE	American Society of Civil Engineers
ASK	Attitude, skills and knowledge
BABS	Bio-prospecting access and benefit-sharing
BCA	Benefit cost analysis
CBA	Cost-benefit analysis
CECA	Civil Engineering Contractors Association
CEO	Chief Executive Officer
CESA	Consulting Engineers South Africa
CHE	Council on Higher Education
CIRIA	Construction industries research and information association
CPA	Construction Products Association
CSR	Corporate Social Responsibility
DEA	Department of Environmental Affairs (within the SA Ministry of Water and Environmental Affairs)
DEADP	Department of Environmental Affairs and Development Planning
DEAT	Department of Environmental Affairs and Tourism (which became DEA)
DME	Department of Minerals and Energy (which became DMR)
DMR	Department of Mineral Resources
EA	Engineers Australia
EAP	Environmental assessment practitioner
EC	Engineering Council
ECN	Engineers Council of Namibia
ECSA	Engineering Council of South Africa
ECUK	Engineering Council of the United Kingdom
EED	Environmental Engineering Division, SAICE
EFTSL	Equivalent full-time student load
EIA	Environmental impact assessment
EIZ	Engineering Institution of Zambia
ESD	Ecologically sustainable development
ESI	Environmental sustainability indicators
ESI2009	Environmental Sustainability Indicators. Technical Report 2009
FEE	Forum for Economics and Environment
FIDIC	International Federation of Consulting Engineers
GDP	Gross domestic product
GLF	George Leadership Forum
GLF	George Leadership Forum
GNP	Gross national product
GPI	Genuine Progress Indicator
GRI	Garden Route Investments / Global Reporting Initiative
GTZ	<i>Deutsche Gesellschaft für Technische Zusammenarbeit</i>
HDI	Human Development Index
HSDI	Hoogekraal Sustainable Development Initiative
ICC	International Chamber of Commerce

ICE	Institution of Civil Engineers, London
ICMM	International Council on Mining and Metals
IE	Industrial ecology
IEA	Institution of Engineers Australia
IEM	Integrated Environmental Management / Institution of Engineers Mauritius
IET	Institution of Engineers Tanzania
IEW	Index of Economic Well-being
IIED	International Institute for Environment and Development
INES	International Network of Engineers and Scientists
IoDSA	Institute of Directors of Southern Africa
IPAT	Environmental impact = population x affluence x technology
IPCC	Intergovernmental Panel on Climate Change
IPENZ	Institution of Professional Engineers New Zealand
ISEW	Index of Sustainable Economic Welfare
IUCN	International Union for the Conservation of Nature (World Conservation Union)
LCA	Life cycle analysis
LWF	Lutheran World Federation
MCDA	Multi-criteria decision analysis
MDP	Measure of Domestic Progress
MEAB	Millennium Ecosystem Assessment Board
MEC	Member of the Executive Council
MTSF	Medium Term Strategic Framework
NDC	National Development Commission
NDP	National Development Plan
NEMA	National Environmental Management Act (107 of 1998)
NFSD	National Framework for Sustainable Development
NGO	Non-governmental organisation
NMMU	Nelson Mandela Metropolitan University
NPC	National Planning Commission
NSESD	National Strategy for Ecologically Sustainable Development
NSSD	National Strategy for Sustainable Development and Action Plan
OECD	Organisation for Economic Co-operation and Development
PCE	Pondoland Centre of Endemism
PSDF	Proposed Sustainable Development Framework
RIMS	Rational interaction for moral sensitivity
SAICE	The South African Institution of Civil Engineering
SAIChE	South African Institute of Chemical Engineers
SAIEE	South African Institute of Electrical Engineers
SAIIE	Southern African Institute for Industrial Engineering
SANRAL	South African National Roads Agency Limited
SANZ	Sustainable Aotearoa New Zealand Inc
SCLC	Southern Cape Land Committee
SDC	Sustainable Development Council
SDI	Sustainable Development Initiative
SDI	Social development initiative
SDS	Sustainable development strategies

SEA	Strategic environmental assessment
SIA	Social impact assessment
TBL	Triple bottom line
TEM	Transworld Energy and Mineral Resources
UNCED	United Nations Conference on Environment and Development, Rio de Janeiro 1992
UNCHE	United Nations Conference on the Human Environment
UNDP	United Nations Development Programme
UNEP	The United Nations Environmental Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WBCSD	World Business Council for Sustainable Development
WCC	Wild Coast Consortium
WCED	United Nations World Commission on Environment and Development
WCPG	Western Cape Provincial Government
WCS	World Conservation Strategy (publication)
WCTR	Wild Coast Toll Road
WESSA	Wildlife and Environment Society of South Africa
WFEO	World Federation of Engineering Organisations
WMO	World Meteorological Organisation
WSSD	United Nations World Summit on Sustainable Development, Johannesburg, 2002
WWF	World Wide Fund for Nature

## CHAPTER 1

### INTRODUCTION

The Earth is one but the world is not. We all depend on one biosphere for sustaining our lives. Yet each community, each country, strives for survival and prosperity with little regard for its impacts on others. Some consume the Earth's resources at a rate that would leave little for future generations. Others, many more in number, consume far too little and live with the prospects of hunger, squalor, disease, and early death. (WCED, 1987: 1)

A fundamental point of departure of this study is that the environment<sup>1</sup> is under threat, in some cases critically so, due to the impact of human activities. This threat is rooted in a human mind-set that places humans outside and above nature, from which position they practice a colonial lordship over nature. In the second instance, this study will pointedly investigate the role of engineering in this scenario – in particular if, and to what extent engineering practice is a product of this mind-set, but then also what could be done by engineers to address this mind-set and the dominance over nature that follows from it.

Threats to the environment may in the final instance also be manifestations of threats to the well-being of humans. The publication, *Global Environmental Outlook 4*, highlights, from this human perspective, the environmental threats as follows:

- In some cases, climate change is having severe effects on human health, food production, security and resource availability.
- Extreme weather conditions are having an increasingly large impact on vulnerable human communities, particularly the world's poor.
- Both indoor and outdoor pollution is still causing many premature deaths.
- Land degradation is decreasing agricultural productivity, resulting in lower incomes and reduced food security.
- Decreasing supplies of safe water are jeopardizing human health and economic activity.

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<sup>1</sup> The term *environment* may here be interpreted as the *natural* environment, that is to say the bio-physical environment, but its interpretation can vary, and later in this chapter more attention will specifically be focussed on these various interpretations.

- Drastic reductions of fish stocks are creating both economic losses and a loss of food supply.
- Accelerating species extinction rates are threatening the loss of unique genetic pools, possible sources for future medical and agricultural advances.

Choices made today will determine how these threats will unfold in the future ... To ensure long-term well-being, we must take an alternative approach to development, one that acknowledges the importance of the environment. (UNEP, 2007: 6)

While the above list may not be exhaustive, it is sufficient to indicate that these threats are real, and the conclusion reached here above reaffirms the contention that the problem inheres in the stance that humans adopt towards the environment. For much of history and in most societies man is seen as the master of nature. In Western society with its Judaeo-Christian background this attitude is derived from the biblical injunctions:

So God created man in his own image ... male and female created he them. ... [A]nd God said unto them, Be fruitful, and multiply, and replenish the earth, and subdue it; and have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moveth upon the earth. (Genesis 1: 27-28<sup>2</sup>)

Embroidering on this theme, Lynn White (2003) argues strongly that the environmental crises of our times are rooted in this Christian dogma that sets mankind apart from nature, and uses Western science and technology to elevate humans to a position of control over the rest of nature.<sup>3</sup> Nature is seen as an adversary and its subjugation, abetted through the use of technology, is echoed in Kipling's imperialistic line:

Keep ye the Law – be swift in all obedience  
Clear the land of evil, drive the road and bridge the ford.<sup>4</sup>

It may be argued that it is this Christo-scientific mind-set that sanctions the wasteful, consumerist lifestyles of the West. Furthermore, the powerful Western media sets these lifestyles up as desirable goals to which all, including developing societies may aspire. Essentially it is the Western world-view that is here cast in the role of villain. The reason for this is that its

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<sup>2</sup> The Bible, King James Version.

<sup>3</sup> It will be shown later that White does acknowledge a minority Christian viewpoint – that of St Francis of Assisi, who (uniquely it seems) treats nature with respect and humility. In modern times this viewpoint has received increasingly more support as is evidenced by the words of the Archbishop of Canterbury: “For our concept of God forbids the idea of a cheap creation, of a throwaway universe in which everything is expendable save human existence. The whole universe is a work of love.” (Linzey, 2003: 59)

<sup>4</sup> *A Song of the English* by Rudyard Kipling in *The Oxford Dictionary of Quotations* (1953: 301). London: OUP.

ethics and values, currently dominant in global ... society, are fundamentally opposed to the concept that human activity must lie within the constraints of the biosphere. Although societies ... usually have a wide variety of ethical views and stances, the one that is quite dominant at the present time relates to our support and acceptance of the mainstream capitalist mixed economy model. This is based on neoclassical economics, the legal systems required to support it, and the political structures needed to support both.

In the Western tradition, this model has its basis in the utilitarian ethic and the social contract theory of property rights that goes with it. Utility (happiness) is held to be directly related to material income and wealth, and individual self interest is assumed ('economic man'). Economic growth is seen as the only way to achieve more utility. Nature is valued only in terms of what it can offer to generate utility for humans – that is, nature has only instrumental value.<sup>5</sup> (SANZ, 2009: 11)

It is from this said perspective that one of the principal themes of this study emerges, a theme that is here portrayed as the *environmental dilemma*. The environmental dilemma results from the tension that exists between development (according to the Western model) on the one hand, and environmental considerations on the other.<sup>6</sup> Engineers are intimately involved in development activities, and hence are primary role players in the environmental dilemma. White's hypothesis, while debatable, and the views of SANZ<sup>7</sup> outlined here above, suggest that the social and professional milieu in which engineers (at least those in Western style countries) operate, almost inevitably places them in an adversarial position towards the environment. The real life example in §1.1 will illustrate how this conflict, that is to say the so-called environmental dilemma, can develop.

## 1.1 THE PARKWAY THAT NEVER WAS

In the nineteen fifties the City of Port Elizabeth was in dire need of a north/south freeway as the existing road infrastructure into the city had become very congested. The Cape Provincial

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<sup>5</sup> Terms such as 'utilitarian ethic' and 'instrumental value' will receive fuller treatment later in this study.

<sup>6</sup> While the environmental dilemma as outlined here is reflective of practical conflicts (e.g do we build a road through the unsullied natural areas of the Wild Coast or do we not (see §9.2)), there is also a more cerebral conflict that Norton characterises as the "environmentalists' dilemma" (1994: 4-9). It arises between environmentalists of an anthropocentric orientation as opposed to those of a non-anthropocentric orientation (or those who value nature instrumentally as opposed to those who value nature intrinsically) (see §3.1.2), and later in this study these alternative positions are identified through the designations of *weak* and *strong sustainability*.

<sup>7</sup> Sustainable Aotearoa New Zealand Inc.

Administration and the National Transport Commission were prepared to commit R5 million then towards the cost of this freeway provided that it could be linked back to join a National Road. For this reason steps were taken to proclaim an east/west freeway link running up the Baakens Valley, which would connect the needed north/south freeway to the N2 National Road. Thus, almost as an afterthought, the idea of the Baakens Parkway was born. The Baakens Valley is an undeveloped green lung running through the centre of the city. It stretches from the western suburbs right down to the coast. Although some parts of the valley had been subjected to intentional preservation actions, for the most part it was quite undeveloped, and covered with natural vegetation. The idea of a freeway through this area aroused the ire and strenuous opposition of a small, but vociferous group of citizens, who considered the valley to be a valuable green legacy, and were appalled at the potential loss of this green heritage to the city. (See Figure 1.1.)



FIGURE 1.1: BAAKENS VALLEY

Subsequently, and in spite of this opposition it was in the late sixties that the Port Elizabeth City Council approved, in principle, the building of the Baakens Parkway. The construction of the north/south freeway, known as Settler's Way, went ahead, and incorporated into its structure were the ramp stubs necessary to connect to the future Baakens Parkway. Subsequent traffic studies confirmed the need for an east/west connection, but the opposers of the Baakens Parkway, now organised as the Baakens Action Committee, argued for another route, which in their estimation would not only be less

environmentally destructive, but also cheaper. The City Engineer's Department of the Port Elizabeth Municipality maintained a strong pro-Baakens Parkway stance. In 1971 the City Council rejected the Baakens Action Committee's proposal by a large majority. While the concepts of transparency and public participation were not yet in vogue in those days, the Baakens Action Committee continued their anti-Parkway campaign through the press and by holding public meetings, and gradually gained not only more public support, but also the support of a significant number of the city councillors.

Eventually public opposition, and maybe also the cost involved, caused the full City Council to reconsider its initial support for the scheme, and the City Engineer's Department was asked to resubmit the proposal allowing for alternative solutions. This they did, coming up with seven route alternatives, most of which would still impact quite heavily on the Baakens Valley (City of Port Elizabeth, 1979). They also even, quite novelly for those days, considered the "no-go" option.<sup>8</sup> One may be critical of the City Engineer's Department for not doing these things in the first place, but one can only do so with the benefit of hindsight, as all of these steps, which nowadays may be considered to be part of good environmental practice, were not the norm then. It is also interesting to see that the original Baakens Parkway proposal was considerably more expensive than the cheapest alternative tabled. It must also be noted that the original alternative proposed by the Baakens Action Committee (which fell outside of the valley) was not seriously considered as it was said to be "too far south to fulfil the needs ...".

By now however public sentiment seemed to be overwhelmingly against the Parkway idea. In June 1979, based on, it was said, cost and fuel shortage considerations, the City Council decided to rescind its support for Parkway. To this day no major east/west route has been constructed, and although traffic congestion prevails during peak hours, it does not appear that the lack of the Parkway has, as it was argued at the time, significantly stunted development in the City. And the ramp stubs on Settler's Way stand as mute reminders of the Parkway that never was. (See Figure 1.2.)

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<sup>8</sup> The "no-go" option is the option to maintain the status quo.



FIGURE 1.2: BAAKENS PARKWAY RAMP STUB

The purpose in relating this story of the Baakens Parkway is, as was suggested, to illustrate the tension that often exists between development activities and concern for the natural environment, or between developers and environmental activists, or between engineers and environmentally concerned members of the public.<sup>9</sup> Inevitably *all* development impacts upon the environment.<sup>10</sup> However from the perspective of the developer, the negative environmental impact is a small price to pay for the advantages that development brings. From the environmental point of view the cost is too high – the advantages that some developments bring do not compensate for the environmental losses that are incurred – particularly too if the needs of future generations are taken into account.

How does one, in the face of such diametrically opposed views, decide which point of view should

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<sup>9</sup> Again the opposing positions are broadly stated here and the finer, more theoretical contra-positions, as articulated by Norton (1994: 4-9) will receive fuller attention later on.

<sup>10</sup> While in a general sense this may be true, what this study is concerned with, more pertinently, is the development of infrastructure.

prevail? What is the right thing to do?<sup>11</sup> Encapsulated in these questions is exactly the dilemma that this study attempts to explore. Thus the question being investigated is: how do we address the tension between development and environmental concerns, and then also as an offshoot of this, how do we moderate or transform engineering practice<sup>12</sup> so that environmental concerns are adequately attended to? While ‘moderate’ suggests modest adaptations to engineering practice and ‘transform’ more radical changes, the need for either one of these approaches, or both, will also need to be considered.

Having tried to illustrate, by the way of a narrative, the nature of the problem that drives this study, it still remains to formulate more explicitly the research questions that this study will address. However this task will be facilitated if first a more elaborate background to the problem is presented.

## 1.2 BACKGROUND

From many accounts the natural environment appears to be in decline. The Millennium Ecosystem Assessment Board expressed their concern in *Living Beyond our Means* as follows:

Nearly two thirds of the services provided by nature to humankind are found to be in decline worldwide. In effect, the benefits reaped from our engineering of the planet have been achieved by running down natural capital assets. ...

Unless we acknowledge the debt and prevent it from growing, we place in jeopardy the dreams of citizens everywhere to rid the world of hunger, extreme poverty, and avoidable disease – as well as increasing the risk of sudden changes to the planet’s life-support systems from which even the wealthiest may not be shielded.

We also move into a world in which the variety of life becomes ever more limited. The simpler, more uniform landscapes created by human activity have put thousands of species under threat of extinction, affecting both the resilience of natural services and less tangible spiritual or cultural values. (MEAB, 2005: 5)

In general engineers aim to improve human well-being, which in many instances involves adapting the

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<sup>11</sup> Norton argues that these questions are rooted in different world-views and that while “it is tempting to assume that one side or the other in the debate ... is correct, and that there are some facts or theoretical arguments that will decisively vindicate one worldview or the other” it is a focus on “policy” (practical issues) that might provide the common ground for action (1994: 12). This pragmatic position will be dealt with in greater depth at a later stage.

<sup>12</sup> While term *engineering practice* in general refers to the way in which engineers *do* things, it may, in the context of this study, on occasion, also include the theory that informs, and the education that underlies that practice.

environment. However the original noble aim of the engineers becomes compromised, and the outcomes of their activities counter productive, when their actions unintentionally lead to environmental degradations such as those mentioned by the Millennium Ecosystem Assessment Board. Engineers therefore have an obligation to become more aware of the environmental consequences of their actions, particularly when these are subtle and/or long term. To this end it might be said, as a generalisation, that engineers need to improve their environmental literacy. Thus it is the theme of contributing towards an expansion of this environmental literacy that will inform the central research questions of this study. But first, it is expedient to search for a deeper understanding of how environmental concerns have developed, their global nature and their complexity. And then to also look at the different responses they have typically generated from philosophers and ethicists, from society in general, and finally also from engineers.

### 1.2.1 The development of environmental concerns

Modern environmental concerns may range from local issues such as those around the Baakens Valley as described above, to global issues such as climate change. Other environmental concerns, maybe less in the public eye than climate change but also critical, include the issues of biodiversity loss, habitat destruction, resource degradation, unsustainability, etc. Notwithstanding this range it seems that the “essence”<sup>13</sup> of the problem underlying these issues may be traced back to the question of what the proper relationship is between mankind and the natural environment. This question has been considered since the times of antiquity; for example, Aristotle articulated a strongly human-centred or anthropocentric<sup>14</sup> position through the *instrumental value* that he attached to nature:

[P]lants exist for the sake of animals ... All other animals exist for the sake of man ... for the use he can make of them as well as for the food they provide ... If we are then right in believing that nature makes nothing without some end in view, nothing to no purpose, it must be that nature has made all things specifically for the sake of man. (Aristotle quoted by Pierce & VanDeVeer, 1995: 15)

Anthropocentrism has been, since those early times, the dominant orientation of Western society towards nature, strengthened, as White (2003: 57) maintains, by the influence of

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<sup>13</sup> In this text the meaning attached to the word *essence*, is that of a *core element* or an *indispensable quality*, and not that which may be accorded to it in metaphysics, i.e. *substance* or *haecceity*.

<sup>14</sup> The anthropocentric orientation will be discussed in greater depth in Chapter 3.

Christianity and modern technology. However there have been isolated cases of contrarily based positions – for example, St Francis of Assisi, through the kinship and reverence that he felt towards nature, assigned *intrinsic value* to nature. Hence he could say:

Praised be You, my Lord, through our *Sister Mother Earth* who sustains and governs us. (Botzler & Armstrong, 1998: 203; [emphasis added])

White (2003: 58) acknowledges the alternative Christian view presented by St Francis – the “greatest spiritual revolutionary” he calls him – but concludes that this is a minority view that has never become part of mainline Christian thinking. He concludes further that our environmental problems will continue and worsen “until we reject the Christian axiom that nature has no reason for existence save to serve man”.

While White’s view may be contested, the evidence of so many signs of human-generated stress in the natural environment, seems to indicate that humans in general and from whatever persuasion, apparently assign little intrinsic value to the natural environment. That this attitude, together with the exponentially increasing human numbers, and our rapidly expanding ability to adapt and modify the environment to suit our needs, has led to a dramatic increase in the human impact on the environment in the last century, seems irrefutable. More people applying increasing levels of knowledge and technology to impose substantial, in many cases irreversible, changes on the environment, has caused alarm bells to start ringing.<sup>15</sup> It is this widespread human impact on the environment, which includes resource degradation and pollution, supported by a questionable human attitude towards nature, which has given birth to the modern, increasingly strident, environmental movement. This movement (or components thereof) are, at times, in direct conflict with mainline political structures, as is evidenced by the recent incarceration of Greenpeace activists in Russian jails.<sup>16</sup>

In the recent history of the development of environmental concern Cunningham and Saigo (1999: 5-7) have identified four stages, which are only roughly chronological, and not mutually exclusive:

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<sup>15</sup> For example Miller notes that in recent times the natural species extinction rate has been exceeded by a factor in the order of thousands (1998: 668), and the Global Footprint Network shows that human demands on nature are continuously increasing, and at present already exceed the earth’s biocapacity by a factor of more than 50 % (2009: 2).

<sup>16</sup> See [http://en.wikipedia.org/wiki/Greenpeace\\_Arctic\\_Sunrise\\_ship\\_case](http://en.wikipedia.org/wiki/Greenpeace_Arctic_Sunrise_ship_case). [Accessed 3 February 2014].

(i) Pragmatic resource conservation

This stage was exemplified by the ideas of Gifford Pinchot, forester and conservation advisor to US President Theodore Roosevelt. His main concern was that natural resources, particularly forests, were to be used efficiently for the benefit of the human population – a strongly instrumental, anthropomorphic stance. In other words, nature only had value to the extent in which it could provide for the satisfaction of human needs, and it only needed to be conserved in order that it could continue to meet these human demands. Norton (1994: 31,36) characterises Pinchot as a “utilitarian conservationist”, and also as the “Minister of Wise Use”.

(ii) Moral and aesthetic nature preservation

John Muir, a geologist and author, and a contemporary of Pinchot, opposed the latter’s utilitarian approach, and while not denying the instrumental (particularly spiritual) value of nature, he also felt that nature deserved to exist for its own sake. For Muir nature (in particular areas of pristine beauty) was sacred, and its value to humans was intangible and certainly non-consumptive. It needed to be preserved for its intrinsic value. In contrast to Pinchot, Norton (1994: 31, 36) sees Muir as a “nature-worshipping preservationist”, and then also as the “Minister of Aesthetic Appreciation”.

(iii) Growing concern about environmental degradation

The book, *Silent Spring*, by Rachel Carson (1962) exposed, what up to then had not been widely known, the evident persistence of chemical pollutants in the natural environment and the dangers that this held for humans and animals. This seminal work by Carson is often credited as heralding the birth of the modern environmental movement, which increasingly concerned itself with the progressive degradation of the natural environment (Dresner, 2007: 21). Of prime concern here was the belief that the capacity of nature to assimilate waste was being exceeded, and hence that the so-called ecological services (e.g. fresh air and clean water) provided by nature were being put under threat.

(iv) Global environmental concerns

The manifestation of worldwide environmental problems such as global warming and atmospheric ozone depletion, is evidence of the fact that many environmental problems

breach national boundaries. A basic principle of environmental rights, the ‘polluter pays’ principle is under threat here. For example the inhabitants of island states face the loss of their land due to sea-level rise induced by global warming, while the major contributors to this problem (the industrialised countries) come off (relatively) scot-free. International co-operation is the logical route through which such transnational problems are to be addressed. Examples here are international forums such as the World Commission on Environment and Development,<sup>17</sup> the Rio Earth Summit in 1992, the World Summit on Sustainable Development held in Johannesburg in 2002, and international forms of cooperation and agreement such as the International Whaling Commission and the Kyoto Protocol.

While it is clear that environmental concern has become a fact of modern life, it does not seem to have prevented or significantly slowed the march of consumerism and the use of evermore sophisticated forms of technology, both of which, as White (2003) and others contend, are deemed to be major contributors towards our environmental malaise.<sup>18</sup> If these contentions are correct, then it follows that engineers, as the agents of technology, and in this role as accessories to consumerism, have to face the accusation of being guilty parties (even if unwilling ones, as some may argue). It appears that engineers have, in their role as agents of development, traditionally operated mostly as utilitarians, which places them in the first of the four stages of environmental concern mentioned above, a position many regard as inadequate. Given the extent to which modern society is dependent on technology, and then the expertise that engineers have in this regard, they can, potentially, play a significant role in addressing and ameliorating the resulting environmental problems. A case may therefore be argued that there is a strong need to broaden and deepen the environmental understanding and approach of engineers.<sup>19</sup>

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<sup>17</sup> The 1987 report of this Commission, *Our Common Future*, was a significant milestone in the development of environmental concern.

<sup>18</sup> This relationship is addressed in greater detail in §1.2.3.

<sup>19</sup> There are already many, many initiatives in this regard, and where relevant, these will be referred to in this dissertation.

### 1.2.2 The social dimension of environmental concern

As has been stated, the initial impetus of the modern environmental movement arose around concerns about the state of deterioration of the natural environment. These concerns are sometimes referred to as the so-called “green issues”. In particular one may identify problems such as the loss of biodiversity, desertification, and terrestrial and atmospheric pollution as examples of green issues. However, at international forums, it soon became evident that this insular focus on green matters would not suffice, as most developing countries had other priorities. For example, at the UN Conference on the Human Environment held in Stockholm in 1972, the Indian prime minister observed, quite bluntly, that “[p]overty is the worst [form of] pollution” (Dresner, 2007: 28). The 1987 World Commission on Environment and Development report, *Our Common Future* regarded inequity as “the planet’s main environmental problem” (Kirkby, *et al.*, 1995: 7). And so inevitably links between problems in the biophysical environment and many of those prevalent in the social environment, the so-called “brown issues”, became apparent.

In many developing countries the political landscape is dominated by social problems such as high population growth rates, poor medical services, poverty and malnutrition. People in these countries are so involved in dealing with these social problems that they have little time or capacity left to deal with problems of the natural environment, even if the latter relate, directly or indirectly, to the former. The excessive resource demands of the developed world creates markets for the natural resources of the poorer countries which, for economic reasons, they cannot ignore, and which, consequently, may in many cases, lead to further environmental deterioration in the poor countries. This dichotomy between the “haves” (the developed countries or the rich) and the “have nots” (the developing countries or the poor) has been articulated as the North/South divide. The North, representing the developed world, often has enough political power and economic muscle to transfer its extravagant resource demands to the South. The South, being the developing countries where the abovementioned social problems are prevalent, see economic benefit in trying to meet the resource demands of the North, particularly when these are sweetened by promises of development aid. However the resulting social upliftment strategies have largely been ineffectual, and development loans granted by the North contribute to the crippling debt burden of the South. Tribal animosities,

despotic regimes and self-enriching elites in the South only deepen the social and environmental ills prevalent in these countries.

Many of those living in the developing countries aspire to the levels of well-being, economic and otherwise, that the citizens of the developed countries enjoy. However this affluence and technological advancement of the developed, mostly Westernised, societies has come at a great environmental cost. The soaring consumer demands of Western lifestyles are placing burdens on the natural environment far beyond the borders of the countries concerned. Miller highlights this skewed resource demand between developed and developing countries as follows:

... one U.S. citizen consumes 35 times as much as the average citizen of India and 100 times as much as the average person in the world's poorest countries. Thus poor parents in a developing country would need 70-200 children to have the same lifetime environmental impact as two children in a typical U.S. family. (1998: 21)

This skewed level of consumption is illustrated quite vividly in Figure 1.3:

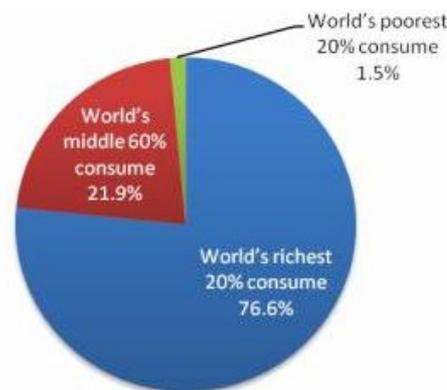


FIGURE 1.3: SHARE OF THE WORLD'S PRIVATE CONSUMPTION IN 2005  
(Shah, 2010: no page numbers)

Thus, if the aim of development in the poor countries is the emulation of consumerist Western lifestyles, one can only foresee that the environmental problems of the world will proliferate, possibly out of control, as the availability and renewal capacity of the natural resources of the world are overwhelmed.<sup>20</sup> Thus the problem lies not only in the present levels of material consumption and technology use of the West, but also in the attraction that it holds for developing countries. As Schumacher stated in his book *Small is Beautiful*:

<sup>20</sup> Wackernagel & Rees (1996: 15) contend that it would require the capacity of the present world plus two additional worlds if all the people on the earth are to live according to the US standards.

An attitude to life which seeks fulfilment in the single-minded pursuit of wealth – in short, materialism – does not fit into this world, because it contains within itself no limiting principle, while the environment in which it is placed is strictly limited. (1993: 17)

The same theme emerges in Peter Singer's book, *How are we to live?*, which he aptly subtitled, *Ethics in an age of self-interest*. In arguing for a new ethical approach he states:

A better life is open to us – in every sense of the term, except the sense made dominant by a consumer society that promotes acquisition as the standard of what is good. Once we get rid of that dominant conception of the good life, we can again bring to the centre of the stage questions about the preservation of the planet's ecology, and about global justice. (1997: 20-21)

While economists often quote statistics that appear to indicate that the scourge of poverty in the world is decreasing, Swilling and Annecke point out that such conclusions depend on the measure of poverty used in the statistical analysis, and furthermore that the global figures mask significant regional disparities. The problem is compounded by the world wide trend of urbanisation, which for many means living in slums characterised by poverty, disease and inadequate services (Swilling & Annecke, 2012: 38, 41). They conclude that from:

... a sustainability perspective ... poverty cannot be detached from equality, especially when it comes to unequal consumption of finite natural resources and eco-system services ... [the] over-consumption by a few inevitably means less for the majority ... When the lens is widened from poverty to inequality, what emerges is not simply the quantification of poverty but also the power relations that preserve the global structures of inequality that ensure the continuation of poverty. (Swilling & Annecke, 2012, 38)

Given the interrelationships described above, this study clearly cannot adequately address the environmental dilemma, if it does not recognise that the linkage between the problems of the natural and social environments is inextricable and beyond question.

### **1.2.3 The complex nature of environmental problems**

To further elucidate the impact of human activities on the natural environment, one may use a model, originally formulated by Ehrlich and Holdren,<sup>21</sup> which affirms the environment/society linkage (Miller, 1998: 21). This model suggests that the environmental impact can be

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<sup>21</sup> In the *Bulletin of the Atomic Scientists* (p. 19) of May 1972.

conceptualised as the product of a number of factors:

$$I = P \times A \times T$$

Where I = environmental impact

P = number of people

A = number of units of resource use per person, which is a function of personal affluence

T = environmental impact per unit of resource use

This simple equation demonstrates that environmental impact is, in the first instance, dependent on the population size (P), with bigger populations obviously having a large impact. In the second instance, the higher the level of consumption per person (A), which is a function of the affluence and the cultural preferences of a society, the higher will be the environmental impact. The third factor, the environmental impact of each unit of resource used or consumed, is usually closely associated with the level of technology employed (T). Thus in poor countries, with high population densities and growth rates it will be the factor P that dominates, but in rich countries, with high levels of consumption it is the factor A that will dominate. It is therefore, on the one hand, increasing human numbers that put pressure on the environment, but, on the other hand, it is also the increased capacity per capita to utilise resources and to pollute the environment, that contributes significantly to environmental degradation – environmental degradation which may either be exacerbated or ameliorated through the technology employed, factor T.

The above equation may be used to highlight two aspects of the environmental dilemma. Firstly, in underlining the relationship between environmental impact and human attributes, such as affluence (factor A), it reinforces the message that issues of the natural environment and social issues are strongly interrelated. Secondly, it clearly, and significantly from an engineering perspective, identifies technology (factor T) as an important determinant of environmental impact, thus reinforcing the message that engineers, the purveyors of technology, are major role players in this regard.

As has been said here above, problems in the natural environment and social problems are often characterised as “green” and “brown” issues respectively. Now there are also technology issues,

which perhaps, to carry the colour idiom further, one could call the “grey” issues.<sup>22</sup> These are, for example, issues of efficient or inefficient resource use, recycling, industrial ecology, appropriate technology, etc. And then Kirkby, *et al.*, (1995: 6) go further to outline a fourth sphere of environment related problems, that of global security. As examples they cite the frequent occurrences of national and international conflict, not least so in Africa, and which are undergirded by a buoyant weapons market. To this one may add the high levels of crime being experienced across the world, and not least so here in South Africa. May we call manifestations of this new genre of environment related problems dealing with personal and national security, “red” issues? War and violence negate in a dramatic manner the ideals of an environmentally sustainable society. Ironically the establishment of the United Nations Organisation and the cessation of the Cold War have not decreased the frequency of conflict. It is also ironical that most of these conflicts occur in developing countries where apart from the killing and destruction, many of the citizens of these countries are turned into refugees and natural resources are destroyed as acts of war. The weaponry used in these conflicts is mostly obtained from countries of the North, resulting in the further impoverishment and indebtedness of the countries of the South.<sup>23</sup> The competition around diminishing natural resources can be a further source of conflict.

It is evident from the above that the initial, narrow perception of environmental problems as mono-coloured green issues, has evolved into a very complex, multi-coloured array of interrelationships between green, brown, grey and red issues. Furthermore, as will become evident in the course of this study, the complexity of these interrelationships is far from clearly understood, and indeed, it is hoped that this study could make some contribution towards a better understanding of these interrelationships. It needs to be said that when faced with this array of interrelated issues one may be discomforted, if not dismayed by the inability of the traditional scientific method<sup>24</sup> to provide coherent answers. This may be because the underlying

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<sup>22</sup> In jokes engineers and technicians are often referred to as the ‘little grey men’ industriously working away at their projects, mostly quite oblivious of their surroundings.

<sup>23</sup> Once again engineers, and specifically not only engineers who are specialised in the field of weaponry, have to acknowledge the major role they can play in the escalation of these “red” issues. This fact has been recognised and it has resulted in the establishment of an NGO, the *International Network of Engineers and Scientists* (INES), which focusses *inter alia* on “disarmament and international peace, ethics, justice and sustainable development” ([www.inesglobal.com](http://www.inesglobal.com)).

<sup>24</sup> This scientific method, the Newtonian method, is mostly the basis for engineering theory and practice.

assumptions of this method, such as reductionism, linear causality and predictability, are inadequate for the complex issues being dealt with. Some theorists have moved towards more systems oriented approaches, and of late *complexity theory* has come to the fore as a means of handling problems characterised by multiple influences and uncertainty. While it will be beyond the scope of this study to enter deeply into the technicalities of complexity theory, its relevance will be briefly discussed in Chapter 11.

A simple way of illustrating the complex interactions in the problems referred to here above, is to broaden our understanding of the environment, from its narrow focus on the natural environment to the holistic conceptualisation depicted in Figure 1.4. Thus conceived, the environment consists of more than its biophysical components; it has social, economic, historical, political, etc. connotations as well.

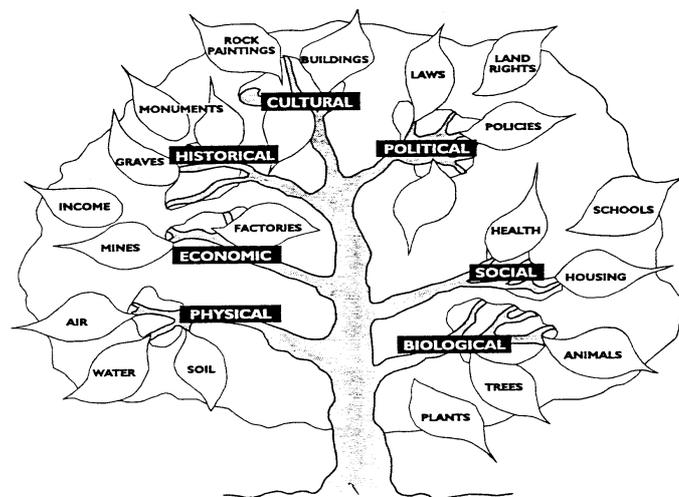


FIGURE 1.4: THE ENVIRONMENT  
(Sowman & Urquhart, 1996: 2)

In this study, and in other literature too, the use of the term *environment* and its derivatives could thus either be more narrowly interpreted as the natural environment, or otherwise more broadly as suggested in Figure 1.4. Certainly a related concept, *sustainable development*, which will feature prominently in this study, and which represents a systematic approach towards dealing with problems of the broad environment, is based on the all-embracing understanding of the environment. Also when speaking of *environmental impact assessment* it is understood that impacts on the natural, social and economic environments will be assessed. However, in

other instances, the interpretation of the term *environment* is narrowed down to the natural environment. For example, the phrase *environmental law* refers mainly to legislation that applies to issues of the natural environment, and the study of *environmental ethics* focusses on ethical issues that arise from the ways in which humans relate to nature. Thus often one has to consider the context in which the term *environment* is used in order to ascertain whether the broader or narrower interpretation is intended. It however needs to be reiterated that a holistic understanding of the environment, that is to say, one in which the broad array of *all* its components, and the interrelationships that exist between them, is considered, is quite fundamental to sustainable development and hence to this study as well. But, having said that, it generally remains quite common to find the term *environment* being used in reference to the natural environment only, and this study will, in general, also conform to that usage. This is done mainly as a matter of convenience, but certainly on occasion, the context will imply that the broader interpretation is intended.

This trend towards the inclusion of social issues into a broadened perception of the environment could lead to some disquiet in environmental circles when the social concerns are perceived to override the concerns with respect to the natural environment. (The extensive social debates and the numerous social goals that emanated from the World Summit on Sustainable Development held in Johannesburg in 2002 might be a case in point.) This development can be seen as the result of an anthropocentric bias towards environmental concerns, where the world is viewed from a dominant human perspective. In this perspective human beings are seen as the central reality of the universe.<sup>25</sup> A more accurate perspective, according to Rowe, is the ecocentric perspective where the *ecosphere* (the aggregate of the atmosphere, the hydrosphere, the lithosphere and the biosphere) is the prime environmental reality. The ecosphere is the ultimate bed from which all components of the environment spring, and none of the components enjoy pre-eminence over the others (Rowe, 1989: 123-126). This tension between ecocentric and anthropocentric perspectives, which is evident in many environmental debates, merits a more detailed discussion, and this will be presented in Chapter 3. For the moment, however, it will suffice to affirm that the holistic perception of the environment which requires consideration of all issues, will remain fundamental to this study.

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<sup>25</sup> The South African National *Environmental Management Act* of 1998 also reveals this tendency when it proclaims human welfare as its primary concern (South Africa, 1998: §2(2)).

Given this broad (and yet balanced) understanding of the environment, the range of problems that beset it are equally wide. As there are many texts (e.g. Miller, 1998, and Cunningham & Saigo, 1999) and other sources (e.g. the United Nations Environmental Programme) that detail these environmental problems extensively, further in-depth discussion of them here is not considered necessary. Thus the list given here below is neither detailed nor exhaustive, but it does serve to indicate the range of problems that can be considered environmental:

- overpopulation
- global warming and ozone loss
- deforestation and loss of bio-diversity
- desertification and soil erosion
- profligate use of non-renewable resources (e.g. fossil fuels)
- poverty and malnutrition
- diseases such HIV/AIDS and malaria.

A more comprehensive statement which reflects not only the complex of issues that interrelate the natural and social environments, but also the crucial role played by natural ecosystems in sustaining life, is that published by the Millennium Ecosystem Assessment Board (MEAB) in their report, *Living Beyond our Means*. The MEAB also touches on the threats to these systems, and makes tentative suggestions towards the alleviation of these threats,. According to the MEAB:

Everyone in the world depends on nature and ecosystem services to provide the conditions for a decent, healthy, and secure life.

- Humans have made unprecedented changes to ecosystems in recent decades to meet growing demands for food, fresh water, fibre, and energy.
- These changes have helped to improve the lives of billions, but at the same time they weakened nature's ability to deliver other key services such as purification of air and water, protection from disasters, and the provision of medicines.
- Among the outstanding problems identified by this assessment are the dire state of many of the world's fish stocks; the intense vulnerability of the 2 billion people living in dry regions to the loss of ecosystem services, including water supply; and the growing threat to ecosystems from climate change and nutrient pollution.
- Human activities have taken the planet to the edge of a massive wave of

species extinctions, further threatening our own well-being.

- The loss of services derived from ecosystems is a significant barrier to the achievement of the Millennium Development Goals to reduce poverty, hunger, and disease.
- The pressures on ecosystems will increase globally in coming decades unless human attitudes and actions change.
- Measures to conserve natural resources are more likely to succeed if local communities are given ownership of them, share the benefits, and are involved in decisions.
- Even today's technology and knowledge can reduce considerably the human impact on ecosystems. They are unlikely to be deployed fully, however, until ecosystem services cease to be perceived as free and limitless, and their full value is taken into account.
- Better protection of natural assets will require coordinated efforts across all sections of governments, businesses, and international institutions. The productivity of ecosystems depends on policy choices on investment, trade, subsidy, taxation, and regulation, among others. (2005: 3)

While the above statement may, for some, seem to lean towards problems in the natural environment, it is very explicit in stating that the threats to natural ecosystems, in the final instance, also pose serious threats to human well-being. While the doomsday scenarios painted by some environmental activists may be considered somewhat overly dramatic, there is a general concurrence among environmentalists and scientists that, in response to the environmental threats, some concerted and urgent action is required. However before considering these responses in a little more detail, it is perhaps appropriate to acknowledge that there are those who hold alternative views with respect to the seriousness of the environmental problems, as they have been outlined here above. These are views that mostly downplay the said environmental concerns, and which do not see their consequences as particularly dire. If these contrary views hold water, the value of a study such as this, could be considerably compromised. Thus it is considered necessary to briefly address these alternative views.

#### **1.2.4 Alternative views**

It appears that there are a number of credible persons who hold views that see the so-called environmental problems (such as those listed above) as quite overstated, and who argue that

such problems as there may be, could be managed relatively easily through the application of human ingenuity and modern technology.<sup>26</sup> These critics, such as for example Julyan Simon (1998) and Bjørn Lomborg (2001), accuse the environmental movement of emotional and exaggerated arguments of doom. They often also query the research and the interpretation of the data that environmentalists use in support of their views, claiming that the research is inconclusive, and the data use selective. There can be little doubt that in some cases these critics have convincingly countered the arguments of environmentalists, by posing different and more positive, but yet feasible interpretations of the data used by the environmentalists, by pointing out errors in the environmentalists' analyses, and by quoting other data which support conclusions contrary to those arrived at by the environmentalists.

As this study is based on the premise of the existence of real and critical environmental problems in the world, and as the said contrary views undermine this premise, it follows that they need to be addressed. However while an in-depth scientific investigation into these opposing positions is beyond the scope of the objectives of this study, there are many environmentalists who have adequately discounted these contrary views. It will suffice, in the opinion of the writer, to note that the vast majority of scientists and analysts hold views consistent with the above stated premise of this study. In 1992, some 1 680 of the world's senior scientists (including 102 Nobel laureates) from various countries across the world sent a message to the world leaders, expressing their collective concern at the mounting levels of stress being imposed on the environment (Miller, 1998). The various bodies of the United Nations Organisation, making use of in-house and external research, and experts across the globe, come to the same conclusion (cf. the many environmental reports emanating from the UN, and the documents tabled at the Rio Earth Summit and the World Summit on Sustainable Development).

For another example of environmental contention one can look at is the issue of global warming or climate change; a topic that generates, it seems, a furious supply of hot air. It appears that

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<sup>26</sup> For example, some argue that the climate models used to make global warming predictions are far too inaccurate, and that therefore the forecasts are unnecessarily gloomy. Others may argue that the hunger problems of the world can be alleviated by the use of genetically modified crops. And on the issue of the extensive use of fossil fuels some argue that when shortages in these fuel supplies arise, these will in themselves be the motivation needed for humans to develop alternative energy sources.

most assessments of the support for the global warming theory indicate that a substantial majority of scientists align themselves not only with the theory, but also with the notion that the present and the predicted changes in climate are and will be largely driven by anthropogenic causes. This too has been the conclusion of the Intergovernmental Panel on Climate Change (IPCC), an international body formed under the joint auspices of the United Nations Environment Programme (UNEP) and the World Meteorological Organisation (WMO) in order to track climate change trends. The IPCC makes use of thousands of authors, editors, and reviewers from dozens of countries. Its latest assessment report, for example, cited over 6,000 peer-reviewed scientific studies.<sup>27</sup> Against this, those that play down global warming and its effects are by far in the minority, and the surveys that purport to indicate support for such views generally stand discredited.<sup>28</sup>

It also needs to be pointed out that the scale and nature of many of the posited environmental problems are of such magnitude and seriousness, that the consequences of being proven wrong in the assumption that these problems are real and need urgent attention, would pale into insignificance beside what the consequences would be if the assumption is proved right and no corrective action has been taken. Stated differently, if as a result of holding the contrary view, namely that the environmental problems are exaggerated and overstated, we do not invoke any remedial measures, and then if this view turns out to be erroneous, the consequences could be (to borrow a political phrase) “too ghastly to contemplate”. To take the safer, more conservative approach, i.e. one that accepts the reality and urgency of our environmental problems, would be in line with the *precautionary principle*,<sup>29</sup> one of the basic principles of sustainable development, about which much more will be said in later chapters.

Based on these arguments, the alternative viewpoints will not, in general, be given further consideration in this study. However when the contrary views would in themselves help to clarify the nature of an environmental problem, or an appropriate response to the problem, it

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<sup>27</sup> See <http://www.ipcc.ch/> [accessed 12/04/2010]

<sup>28</sup> See [http://en.wikipedia.org/wiki/Global\\_warming\\_controversy](http://en.wikipedia.org/wiki/Global_warming_controversy) [accessed 1/03/2008].

<sup>29</sup> An explanation of the precautionary principle is given in §7.1.2 and also by Rogers, *et al.* (2008: 98).

may be useful to bring them back into consideration.<sup>30</sup> Thus the approach followed here is not a dogmatic rejection of the contrary views, but rather one of prudence which, while accepting the reality of our environmental problems, still allows for adjustments in approach if sound reasons or alternative conclusions (based on improved data) indicate this.<sup>31</sup>

### **1.3 RESPONSES TO ENVIRONMENTAL CONCERNS**

#### **1.3.1 Fundamental responses to environmental concerns**

As has been indicated above, the environment can be very broadly defined, and as such it is assailed by a wide array of problems, caused mostly by human impact. This human impact arises not only from exponentially increasing human numbers, but also from the way in which we live our lives. While the impact of human numbers is undeniable, it is the impact of human lifestyles on the environment that is, for the moment, considered to be more relevant to the practice of engineering. According to Park it “is important to note that lifestyle reflects underlying values and attitudes, and these are the root of the problem” (1991: 31). All of this implies that if we want to properly address the problems of the environment, we need to change our lifestyles, and that, significantly, these changes need to be more than superficial. This means changes not only to our work and play practices, but also more deep-seated changes to our cultural ways and values.<sup>32</sup> The ubiquitous and intractable nature of some of the problems that beset the broader environment thus suggest that a real and fundamental cultural reorientation – a change of direction – is required of our society. It goes without saying that this

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<sup>30</sup> For example, when the relationship between engineering practice and the environment is being discussed, it might be worth investigating the notion that many, if not the majority of engineers, place the same high levels of faith in human ingenuity and technology as do Simon and Lomborg.

<sup>31</sup> This approach parallels that of the IPCC, which since 1990, has produced four assessment reports, each one updating the previous in the light of new research information that has become available. Where mistakes have been uncovered in these reports, these have been admitted and corrected. The work procedures of the IPCC are designed to incorporate thorough review, corroboration and transparency at all stages. See <http://www.ipcc.ch/> [Accessed 12/04/2010].

<sup>32</sup> One could argue that even our population growth rates are governed by cultural norms.

is not easy to achieve.<sup>33</sup>

Many have argued that a change as fundamental as that which has been suggested here above, can only come about through the adoption, by society, of a new vision; a new world-view; a new paradigm. Sterling phrases it as follows:

The most pressing need is for the emergence, clarification and adoption of a new ecological world view that can create a sustainable culture capable of treating the Earth with gentleness and respect. (1990: 76)

A new world-view goes further than simply consuming a little less; it requires a new way in which we understand the world. Capra argues that the current mechanistic and reductionist world-view, derived from the Cartesian and Newtonian models of the 17<sup>th</sup> century, needs to be replaced by the so-called “systems view” which is “organic, holistic and ecological” (1983:66).

He continues:

The universe is no longer seen as a machine, made up of a multitude of objects, but has to be pictured as one indivisible, dynamic whole whose parts are essentially interrelated and can be understood only as patterns of a cosmic process. (Capra,1983: 66)

Setting sustainability as the goal, Lisa Newton argues that the adversarial approach towards nature inherent in our present lifestyles needs to be replaced by a new “personal worldview” in which “the preservation of nature is part of the way we *want* to live” (2003: 7,12; [emphasis added]). Arne Naess calls for an “*ideological* change [which] will be mainly that of appreciating life quality ... rather than adhering to an increasingly higher standard of living” (1998: 439; [emphasis added]). According to Park the “environmental crisis is as much a crisis of values and motives as a crisis of science and damage” (1991: 31-32).

To find out where this fundamental reorientation is leading to, one may quote Des Jardins:

Environmental issues raise fundamental questions about what we as human beings value, the kind of beings we are, the kind of lives we should live, our place in nature, and the kind of world in which we might flourish. In short, environmental problems raise fundamental questions of ethics and philosophy. (1997: 5)

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<sup>33</sup> It has been argued, for example, that our (Western) society needs to change its consumerist lifestyle, but few people will be willing to give up their flat-screen TVs, 4x4s, and numerous other modern day conveniences, in favour of a more simple lifestyle.

So it appears that the nature of change required from our society is of such a depth that it, in the least, requires a philosophical debate; a debate which is to be waged in the arena of philosophical ethics, or perhaps more particularly, environmental ethics. If one understands *ethics* to mean the philosophical study of what, in given circumstances, would be the *right* thing(s) to do, the *good* thing(s) to strive for, and what to *respect*, then it follows that environmental thinkers, in the face of the environmental problems we are being confronted with, will turn to ethics in an effort to, not only determine the correct course(s) of action and choices, but in a more fundamental sense, to also formulate the new paradigm that we are said to be in need of adopting. This ethical focus on environmental<sup>34</sup> problems has no doubt been a prime reason for the emergence of *environmental ethics* as a special branch of applied ethics. Chapter 3 will delve more deeply into this field, and, in the process, will reveal an ongoing debate within the field of environmental ethics that appears to indicate that no clear cut philosophical resolution of the environmental dilemma has emerged as yet. (It may need to be said that this does not constitute sufficient reason for abandoning the ethical discourse, as the ethical debate will in any event sharpen the thinking and lead to a clearer understanding and clarification of the underlying, basic moral principles.)

Having alluded to the non-resolution of the environmental dilemma in the previous paragraph, and recognising the pressing nature of some of the environmental problems we face, one might argue that society needs to urgently find some pragmatic way forward. This study will argue that this way can be found in the notion and practice of *sustainable development*. It will not only attempt to build a fundamental platform around the concept, but also attempt to develop it as a pragmatic response to our environmental problems. The reasons for this approach will be more fully discussed and justified later in Section B, but it can be said here that not the least of these reasons is the globally wide acceptance that the concept of sustainable development enjoys.

According to Cywinski sustainability attempts to address the conflicting requirements between meeting the desires of a good life and those required for sustaining the (natural) environment (2001: 12). Thus, in this sense, sustainable development aims to resolve the conflict between development and the (natural) environment. However, even a cursory investigation of this

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<sup>34</sup> Here the emphasis is particularly on the natural environment.

concept will reveal that sustainable development, despite its popular appeal, does not present a Holy Grail type solution either. It suffers from many contradictions in terms of how it is perceived, interpreted and used. As a catch phrase sustainable development is clearly very much in vogue, being used in gay abandon by politicians and leaders of industry and commerce alike, apparently without much appreciation or understanding of its full implications. Indeed this debate around the concept and implications of sustainable development is very much ongoing at the present, and so, as has been indicated above, this study may justifiably devote a number of chapters to this topic, in order to understand it and its implications better.

### **1.3.2 Societal responses to environmental concerns**

The response of society to environmental concerns is evidenced through the proliferation of agencies promoting environmental sensitivity and accountability. These bodies range from the formal, e.g. government departments such as (in South Africa) the national *Department of Environmental Affairs*, to the informal, e.g. non-governmental organisations (NGOs) such as the *Wildlife and Environment Society of South Africa*, and from the international, e.g. such as the *United Nations Environment Programme (UNEP)*, to the local, e.g. the *Baakens Valley Preservation Trust*. The effect of these many agencies is that environmental issues are enjoying unprecedented levels of attention in society. However, the multifaceted nature of our perceptions of what constitutes the broader *environment*, and also the intractable nature of some of the problems that beset this broader conception of the environment, results in these agencies often having different agendas and limited effect (in the broader context).

Society is also responding to the environmental challenges on the educational front where there are many initiatives that specifically aim to increase the environmental awareness of learners. For example, the South African national *Department of Education*, supported by the *Environmental Education Association of Southern Africa*, is incorporating environmental topics into the school curriculum. At tertiary institutions the environmental initiatives range from the implementation of full academic programmes, to the inclusion of environmental modules into existing programmes, to the offering of informal short courses. Many of these short courses, and also many environmental conferences on a broader front, are aimed at practising professionals. The engineering profession itself is heavily involved in these activities, and

presently the question is not so much about whether it should be involved in these types of activity or not, but rather how effective these interventions are. Thus it is appropriate that a later chapter of this study be devoted to the role of engineering education in raising environmental awareness and promoting sustainable development.

More formally, society may respond to environmental concerns by means of policies and legislation which create guidelines and controls, such as legal and financial sanctions or incentives.<sup>35</sup> In South Africa this trend is evident in the increasing amount of environmental policy that is being formulated and environmental legislation that has been passed. In this respect the most prominent example one can mention is that of the National Environmental Management Act (NEMA), which was promulgated in 1998, and which has since seen several amendments. This particular Act, and its precursor, the Environment Conservation Act of 1989, have had a significant impact on engineering practice, as they have, *inter alia* prescribed environmental impact assessments (EIAs) for many engineering activities. A later chapter in this study will be devoted to a discussion of the South African environmental law and policies that form the legal backdrop for the implementation of sustainable development.

### **1.3.3 Engineering responses to environmental concerns**

Previous discussions point to the reality of the tension between development activities and environmental concerns, and as engineers are often in the forefront of development projects, it is quite critical to investigate the response of the engineering profession<sup>36</sup> to said environmental concerns. As a starting point it might be worthwhile to investigate by means of case studies the problematic issues that may exist around the environment/engineering interface, and how engineers have responded to these issues. A later chapter in this study will follow up on this line of investigation.

While engineers may endure much criticism about their environmental track record, in some

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<sup>35</sup> As has been pointed out, environmental legislation is one of those areas where the term *environment* more specifically refers to the *natural* environment.

<sup>36</sup> While much of what is said here and later will relate to the engineering professions in general, the primary focus of this study, will be on the *civil engineering* profession in South Africa.

cases maybe deservedly so, it can be noted that considerable effort has been made from within their own ranks to improve, not only their image in this regard, but also their practice. (Often the criticisms levelled at engineers is not of their own making, but is the result of political interventions.) As with society in general, the engineering professions, and the civil engineering profession in particular, are purposefully moving towards more environmentally sensitive practices mainly through approaches that are aligned to the idea of sustainable development. Cywinski mentions numerous institutional agendas which reflect this move (2001: 13-14). Environmental concerns and issues are also increasingly permeating engineering education, and it has already been mentioned that this topic will be dealt with in greater detail in a later chapter of this study.

Generally, but perhaps more particularly in Western societies, engineering practice is, like other professions and businesses, being put under increasing societal pressure to produce mission statements and codes of conduct that reflect environmental concerns. The response of the engineering profession, particularly in Western countries has been quite noteworthy, but perhaps less so in the case of South Africa. As a case in point, the South African Institution of Civil Engineering (SAICE), through its Environmental Engineering Division (EED), posed the following questions in 1997:

Should SAICE include a section on environmental awareness in its Code of Ethics? ... Should we consider sustainable development as an issue in ethics?  
(EED, 1997: 3)

An early version of the code of ethics of SAICE stated that civil engineers should “accept a duty of care to [*inter alia*] ... the environment” and be aware of their “responsibility to protect and conserve the environment” (SAICE, undated). The most recent version of the code of ethics makes more such references to the environment and also to sustainability issues, including a commitment to “seek solutions that are compatible with the principles of sustainable development” (SAICE, 2005b: 3). Is this sufficient to meet the concerns expressed by the EED? More fundamentally, will these (few) environmental/sustainability commitments in the code of ethics suffice to produce the reorientation in world-view which, as has been suggested here above, might be required? Indeed the question may be asked if the engineering profession is

not so inextricably bound into the traditional Western world-view<sup>37</sup> that the emergence, within the profession, of a new world-view – an “ecological world view”, to use Sterling’s nomenclature (1990: 76) – will be very difficult, if not impossible? Sensing this potential incompatibility, Cywinski, an engineer himself, proposes that, “‘True development’ must be considered a problem of philosophy. It must be based upon the priority of spirit over matter, of person over object, of *ethics over technology*.” (2001: 15; [emphasis added]) Cywinski would then probably agree that an environmental code of ethics for engineers is of great importance. This study will show that some engineering institutions, from across the world, have developed separate, quite elaborate environmental codes of ethics for their members. In a later chapter these will be compared and analysed, and a prototype code proposed for South African engineering practice.

## 1.4 OVERVIEW OF THIS STUDY

### 1.4.1 The central problem statement of this study

The basic premise of this study, as it emanates from the preceding discussions, can be summarised as follows: development activities inevitably impact on the environment, and as a consequence tensions arise between the developmental needs of people on the one hand, and the need to protect the integrity of the environment on the other hand, resulting in the so-called environmental dilemma. Engineers, as the purveyors of development, are inextricably involved in this dilemma. Infrastructure development in particular, the domain of civil engineers, has a large scale and very visible impact on the environment. It is the management, or even better the resolution of this environmental dilemma that forms the central focus of this study.

### 1.4.2 Study objectives

In short, the main objective of this study might be framed as the attempt to establish, given the complex nature of the problematical issues around the environmental dilemma, broad but

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<sup>37</sup> The Western world-view is taken to be one that espouses growth and technology, and hence is, according to many environmental theorists, incompatible with environmental sensitivity and sustainability.

ethically justified guidelines for sound environmental practice, through the mode of sustainable development, particularly as they could apply to the field of civil engineering.

To elaborate, this study investigates, in general, the said tensions between environmental concerns and physical development, and more particularly also how these tensions relate to engineering practice. Firstly an attempt will be made to understand the fundamental assumptions underlying the present problematic situation, in particular from an ethical perspective. Secondly, the proposition that, in this situation, the concept of sustainable development might be the desirable development model, will be investigated. This will be done by retracing its historical development and by analysing the assumptions that underpin it. Then thirdly, on the basis of the insights developed up to that point, the concept of sustainable development will be reformulated so that it may effectively inform environmental practice, in particular as it relates to the civil engineering profession in South Africa. This will obviously need to be done against the background of a critical overview of the existing environmental<sup>38</sup> policy and legislative framework in South Africa.

The research goals of this study may thus be formulated as follows:

1. To investigate the ethical underpinnings of the environmental dilemma.
2. To investigate the concept of sustainable development in depth, and the role it may play in resolving the environmental dilemma.
3. To reach, in the South African context,<sup>39</sup> broad, but ethically justified sustainable development guidelines for civil engineers,<sup>40</sup> in the form of:
  - (a) an environmental (or sustainability) code of ethical conduct for civil engineering practice
  - (b) guidelines for the environmental (or sustainability) education of civil engineers.

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<sup>38</sup> In this context 'environmental' includes the notion of sustainable development.

<sup>39</sup> This includes the existing policy and legislative framework in South Africa.

<sup>40</sup> Notwithstanding the focus here on civil engineering, much of what will be proposed later will also apply to the broader field of engineering, given that civil engineering is but a branch of the broader field. And indeed this broader field will also serve as a springboard for some of the conclusions reached. Having said that, it may also be noted that in the final stages of this study the focus moves to a new branch of engineering, viz. *sustainability engineering*.

### **1.4.3 Value of this study**

It is felt that the civil engineering profession in South Africa, and for that matter the whole of the engineering profession in South Africa, has a fairly rudimentary approach to environmental and sustainability issues. After exploring the engineering/environment interface and analysing the concept of sustainable development and its ethical underpinnings, this study will hopefully provide more clarity on the environmental problems that emerge in engineering practice, and assist in articulating the role sustainable development should play in addressing these. While the immediate outcomes of this study will be in the form of guidelines for a proposed code of environmental (or sustainability) ethics for civil engineers, and appropriate criteria for environmental (or sustainability) engineering curriculums, in the broader context it may point to what is needed for South African engineers to become true champions of sustainable development.

### **1.4.4 Chapter outline of this study**

This study is reported on as follows:

#### Chapter 1: Introduction

The problem area being covered by this study is introduced. Preceded by an illustrative case study, the root problem being investigated in this study is characterised as the so-called environmental dilemma. It is found that this dilemma is of direct relevance to the practice of engineering, and as such it becomes the stated focus of this study. By way of familiarisation the significant issues inherent to this problem area are introduced in preparation for the greater in-depth studies which follow in the later chapters. In conclusion the research objectives of this study are defined and a brief chapter outline is given.

#### Section A: Ethical approaches to the environmental dilemma

If the conflict between the need for development and the concerns around the environment may be characterised as the environmental dilemma, and if some of the approaches to this dilemma can be considered more ethically correct than others, then it is appropriate to investigate the ethical underpinnings of these approaches. It is the overall objective of the three chapters in this

section, to articulate this ethical context in which the environmental dilemma may be approached.

Chapter 2: Mainstream ethical thinking

This chapter is introduced with a discussion on the relationships between philosophy and practice, and between ethics and science, as a prelude to an overview of some of the main ethical theories to be found in the literature of philosophy. The objective of this chapter is to establish a moral context in which the discussion of the ethics of the environment and of sustainable development can proceed.

Chapter 3: Environmental ethical thinking

In concert with a burgeoning environmental consciousness in society, environmental ethics has emerged as a recent and separate discipline in the field of philosophical ethics. This chapter firstly outlines the development of this discipline, and then discusses its main modalities. The objective is to get a better understanding of how the environmental dilemma can be addressed in an ethically justified manner.

Chapter 4: A basic ethical model for sustainable development

In this study sustainable development will be identified as the most appropriate way of addressing the environmental dilemma. As a precursor to a fuller discussion of the concept of sustainable development, this chapter outlines an ethical model that can be used as the moral justification for the sustainability approach.

Section B: Sustainable development

It has already been accepted that the environmental dilemma is of direct relevance to engineering practice, and furthermore it has been mooted that sustainable development could be the most appropriate way in which the dilemma can be addressed. To this end the three chapters in this section will be devoted to the clarification and delineation of the concept of sustainable development, all the while foreshadowing its role in environmentally responsible engineering practice.

#### Chapter 5: Sustainable development – what is it?

The relevant literature is reviewed in order to see how the concept of sustainable development developed, how it is justified, and how it is understood. With this background a framework of sustainable development is proposed that can inform (civil) engineering practice and education.

#### Chapter 6: The dimensions of sustainable development

The holistic nature of the concept of sustainable development, as expressed through its various dimensions, will pose particular challenges to engineering practice. This chapter is devoted to identifying and describing the dimensions of sustainable development

#### Chapter 7: A sustainable development framework

To further elucidate the concept of sustainable development, its principles are revisited, and attention is also briefly paid to its measurement. In conclusion, and based on the material presented in this and the previous chapters, the framework for sustainable development, here being proposed as a point of departure for introducing sustainability into engineering practice, is finalised.

### Section C: Sustainable development in South Africa

Having dealt in depth with sustainable development as a concept, the study continues in this section with a more practical and local orientation by focussing on how sustainable development is encountered in the South African context. Firstly an overview of the local legislative and official policy statements on sustainable development is presented, and then secondly, the attention falls on how the South African society in general, but also the engineering profession in particular, in practical situations, face up to the challenges of sustainable development.

#### Chapter 8: The environmental law and policy framework in South Africa

A critical analysis of the evolving environmental and sustainable development policy and legislative framework in South Africa is presented. The ultimate aim is to appraise how this legal framework on sustainable development can (or should) shape engineering practice in this country.

Chapter 9: How sustainable are development activities in South Africa?

The above question is pursued, by analysing, against the background of the insights developed in the previous chapters, two South African case studies which exemplify the environmental dilemma, particularly as it impinges upon the practice of civil engineering. This is done in order to expose the contemporary challenges that the ideals of sustainable development pose for (civil) engineering practice in this country.

Section D: Sustainable development and engineering in South Africa

The discussion in this section is now narrowed down to the specific question of how the civil engineering profession in South Africa can respond to the challenges of sustainable development. Answers to this question are attempted in two directions. Firstly the focus is on civil engineering practice and the relevant environmental sustainability codes of conduct, and secondly civil engineering education is considered in terms of its required contribution towards sustainability. (It is not the intention to present an in-depth critique of either civil engineering practice or civil engineering education in their own right, which could be extensive studies in themselves, but simply to explore, on the level of ideas and principles, the link between these two areas and sustainable development.)

Chapter 10: How can the civil engineering profession in South Africa respond to the challenges of sustainable development? – Part 1

This chapter attempts to show how the engineering profession can address, in fairly generic terms, the types of challenges uncovered in the previous chapter. After a general overview of the relationship between engineering and sustainable development, some existing engineering codes of environmental (or sustainability) ethics and conduct from other countries are described and critically analysed, and then compared to the present position in South Africa. Guidelines for the development of such a code for the civil engineering profession in South Africa are proposed.

Chapter 11: How can the civil engineering profession in South Africa respond to the challenges of sustainable development? – Part 2

Having determined the desired objectives for the conduct of civil engineering professionals, the question of an education towards these objectives becomes the next

consideration. The education of civil engineers in South Africa is investigated against what are considered to be the key characteristics of an education in sustainability theory and practices. In conclusion curriculum suggestions are put forward for an educational programme in sustainability engineering.

#### Chapter 12: Epilogue

Here the study is briefly summarised with particular emphasis on its main findings. The value of this study for sustainable development actions in general, and civil engineering practice in particular, is highlighted.

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## SECTION A

### ETHICAL APPROACHES TO THE ENVIRONMENTAL DILEMMA

In this section the ethical foundation of this study is pursued. If the conflict between the need for development and the concerns around the environment may be characterised as the environmental dilemma, and if some of the approaches to this dilemma can be considered more correct ethically than others, then it is appropriate to investigate the ethical underpinnings of these approaches. It is the overall objective of the three chapters in this section, to articulate this ethical context in which the environmental dilemma may be approached.

Firstly, in Chapter 2, the traditional approaches in philosophical ethics, here collectively labelled as mainstream ethics, are briefly discussed. Chapter 3 looks at that branch of philosophical ethics that is particularly pertinent to this study, namely environmental ethics. Foreshadowing Section B, which is focussed on the concept of sustainable development, an attempt at formulating an ethical foundation for this concept is presented in Chapter 4.

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## CHAPTER 2

### MAINSTREAM ETHICAL THINKING

There is something in this more than natural, if philosophy could find it out.  
(Shakespeare)<sup>41</sup>

The research objective of this study, as outlined in the previous chapter, essentially involves an attempt to resolve the environmental dilemma existing between development initiatives on the one hand and environmental concerns on the other. It has been suggested that human actions in general, and development activities in particular have often produced detrimental, and sometimes critically damaging, impacts on the environment. Too often humans simply seem to have got things *wrong*. There thus appears to be a moral or ethical<sup>42</sup> imperative here; we need to *correct* our ways of doing things. When contemplating what the right or wrong thing is to do, whether something is good or bad, or what deserves respect,<sup>43</sup> we are entering into *ethical* debate, and when the issues being debated are environmental issues, it then becomes an environmental ethical debate. Ethics, as a field of study, is a discipline within the broader field of philosophy. This chapter will therefore lead in with a brief discussion around the relationship between philosophy and practice, before moving into an overview of the main ethical traditions encountered in a study of philosophical ethics. The objective is to provide the groundwork for the discussions on environmental ethics in the next chapter, all aimed, in the final instance, towards an informed ethical discourse around the resolution of the environmental dilemma.

#### 2.1 PHILOSOPHY AND ETHICS

As has been stated, ethics and environmental ethics are sub-disciplines of the field of philosophy.

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<sup>41</sup> Hamlet II. ii. (363) (Jenkins, H. (Ed) (1982). **Hamlet**: The Arden Edition of the works of William Shakespeare. London: Methuen.)

<sup>42</sup> In this study *ethics* and *morality* are treated mostly as synonyms, although in a more formal sense ethics might be taken to mean a study of morality.

<sup>43</sup> The context in which the words *right* and *wrong*, *good* and *bad*, and *respect*, are being used here is a *moral* context. There are other contexts in which these words may be used, for example one might say that in South Africa it is wrong to drive one's vehicle on the right hand side of the road – that is not, in essence, a moral statement.

Philosophy has been defined as “thinking about thinking”, a phrase that “brings out the general second-order nature of the subject”(Quinton, 1995: 666). Thus before investigating the value of ethics and environmental ethics towards realising the goals of this study, it may be worthwhile to take a step back, and briefly investigate the role that *philosophy* can play in the resolution of a practical problem such as the environmental dilemma, given that philosophy tends towards abstract, theoretical debate, which may, on the surface at least, seem to have little practical application.

### 2.1.1 Should philosophy provide practical answers?

Given the theoretical nature of philosophy, a question that may arise on both a fundamental and a practical level, is: *should* and *can* philosophy, without compromising its theoretical integrity or exceeding its theoretical bounds, provide answers to practical problems? Consider, for example, a manifestation of the environmental dilemma that emerges when the earthworks being done in preparation for a new housing development can lead to the extinction of some or other species.<sup>44</sup> In such a situation, is it right or wrong to overrule the rights of property owners and developers in calling for the curtailment or abandonment of the development, and importantly, *can one expect philosophy to provide a justification for such action?* If, on a practical level, philosophy *can* provide such a justification, the more fundamental question may be asked if indeed it *should*. There is a school of thought which holds that philosophy should *not* be involved in the direct answering of questions of this kind, that is to say, questions where the answers will be prescriptive for practice. This school of thought maintains that such a practice oriented approach dilutes the value and depth of philosophical inquiry, and instead it is felt that philosophy should rather operate on a more theoretical and ‘pure’ plane.

In the field of environmental philosophy, for example, the question may be asked as to whether environmental philosophers should be involved in environmental activism (practice) or not. Callicott thinks not, for he argues that “the most ‘lasting and effective’ form of environmental activism that philosophers can engage in is simply philosophy itself” (Light & De-Shalit, 2003: 5).

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<sup>44</sup> The saga of the Brenton Blue butterfly that came up some years ago in a coastal housing development is a case in point (Pringle, 1995; Steenkamp, 1998).

Bill Warren (1992) looked more closely at this issue, and after contrasting the opposing views, sought some middle ground which would give legitimacy to applied philosophy, that is to say philosophy that informs practice. On the one hand the argument proceeds from the premise that philosophy was born out of the problems encountered in human life and practice.<sup>45</sup> If thus, it did not have any bearing on practice, it simply became a “sentimental indulgence” or “arbitrary dogma”. On the other hand the feeling is that philosophy and ethics should arise above the level of “sermonising” and prescriptions for action. Emphasis needs to be placed on the analytical role of philosophy and on the ability to conduct a critical enquiry above the level of advocacy. In this second view philosophical ethics has to be theoretical and not normative. However, as indicated above, Warren sought

... a synthesis that would serve as a conclusion that assists students of philosophy to be both ‘removed from’ the world of particulars that too easily ensnare and distract them, and at the same time allows a sense of philosophy’s worthwhileness to that very realm of everyday existence that gave it birth. (1992: 17)

Thus Warren advocated a position which required philosophers not to lose the rigour of theoretical inquiry while at the same time asserting the “genuine continuity between life and philosophy” (1992: 18). John Dewey,<sup>46</sup> quoted by Warren, phrased it as follows:

Philosophy [is] a form of thinking, which, like all thinking, finds its origin in what is uncertain in the subject matter of *experience*, which aims to locate the nature of the perplexity and to frame hypotheses for its clearing up to be tested in *action*. (1992: 18; [emphases added])

In the field of environmental philosophy Light & De-Shalit argue as follows:

At least one reason environmental philosophy should be practiced differently is that the original grounding intuition of environmental philosophy, when it became organized as a formal subdiscipline in philosophy, was that philosophers should do it so as to make a contribution to the resolution of environmental problems in philosophical terms. But if those terms produce only arcane discussions by a few theorists of issues such as the intrinsic value of nature, we will have failed in our aspirations to make a contribution to the resolution of environmental problems. While it is conceivable that eventually

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<sup>45</sup> This approach echoes that of the early philosophers such as Plato, Aristotle and Confucius who were intrigued by what they observed in nature or encountered in political life. Indeed Socrates was to conclude that “the unexamined *life* is not worth living”. (Des Jardins, 1997: 212; [emphasis added])

<sup>46</sup> It may be noted that the importance Dewey attaches to experience and action leads to an approach to philosophy known as pragmatism, which will be dealt with in some greater detail in a later chapter.

our theories of value could filter down to the broader environmental community and to policymakers, the importance of environmental problems warrants taking seriously a more practical and pragmatic set of tasks for the field that might make a more immediate contribution to the solution of these problems. (2003: 9)

While Light & De-Shalit thus have no qualms about the practical intent embodied in the philosophy around the environment, Brody (1983: 1-4) is happy to carry these sentiments forward to the broader field of philosophy itself. He maintains that philosophy:

- is concerned with the nature and validity of the various spheres of human life,
- that it focuses on spheres of human life about which people have concerns,
- that it can, as a result, greatly change the way in which we *behave* in that sphere, and
- that it proposes answers which are rationally defensible.

In line with the above views, this study will proceed on the basis that philosophical argument in general, and the study of ethics or environmental ethics in particular, will indeed have, and should have, a bearing and influence on the practical guidelines which might be expected to flow from the study.

### **2.1.2 How does philosophical ethics provide practical answers?**

Having accepted the legitimacy of philosophical involvement in practical issues, one may next ask how philosophical ethics can supply answers to real life ethical dilemmas? The predicament which arises when development activities cause environmental problems, heretofore characterised as the environmental dilemma, is an example of such a real life ethical dilemma. In the case of the Brenton Blue butterfly, alluded to previously, the rights of the developer to develop a particular piece of land were pitted against the interests of the butterfly in having its habitat preserved on that land. When faced with such competing interests the obvious question that one may pose is, “What is the right thing to do?” Or to be more specific one may ask, “Would something good be destroyed if the habitat of the Brenton Blue is destroyed?” From the perspective of the land owner the question could be, “Should the property rights of the landowners/developers be respected as a human right?” More fundamentally, a second series of questions may be, “How will one know what the right thing, or the good thing to protect is?” or, “What do we mean by the right thing, or the good that deserves respect?” These questions

are the quintessence of the field of philosophical ethics,<sup>47</sup> and in the environmental context, of the field of environmental ethics. The question that heads this sub-section is thus probing the potential of philosophical ethics, or in the context of this study, of environmental ethics, to identify the right things that need to be done, or the good that needs to be pursued, or that which deserves respect, and to justify these choices.

According to Des Jardins (1997: 17) we engage in normative ethics “to make ethical judgements, give advice, and offer evaluations of what ought or should be”. And we justify these judgements on the basis of “a higher level of generality and abstraction” which is the level of “general concepts, principles and theories to which we appeal in defending and explaining normative claims”. In this way an ethical theory can be constructed to become the rational framework within which ethical analysis may be made and ethical positions defended, and on the basis of which certain courses of action may, relative to the degree to which they are consistent or inconsistent with the theory, be recommended or avoided. In addition, Des Jardins (1997: 18) also sees the value of ethical theory in “providing a common language for discussing and understanding ethical issues”, and in developing critical insights into the “patterns and assumptions in our [traditional] ways of thinking”, where, in some cases, these underlying assumptions may even be contributing to the very problems we are trying to solve.

However, having asserted the value of philosophical ethics in deriving practical answers, the mere fact that ethical problems still abound in everyday life, forces one to acknowledge that it is not a forgone conclusion that universally acceptable answers will be found. Some might say, particularly after observing the lack of theoretical agreement in the discussions still to follow, that ethical theorising, far from being clear and definitive in its pronouncements, is rather ambivalent and ambiguous. Instead of clarifying the issues on hand, it is perhaps more likely to lead to further obfuscation and uncertainty, and this may particularly be the case in the environmental arena, where many competing views are evident. Instead of the emergence of a single, coherent ethical theory, it appears (as will become evident later in this chapter) that a variety of ethical theories have been proposed over time, none of which have achieved

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<sup>47</sup> The question, “What is the right thing do?” is characterised as representative of *normative ethics*, whereas the question, “What do we mean by the right thing?” is a question in the field of *meta-ethics* (or philosophical ethics according to Des Jardins). (Thompson, 2006: 34; Des Jardins, 1997: 17)

hegemony. This theoretical profusion indicates that ethical problems can be analysed and debated from a number of different, sometimes even contradictory, perspectives. This lack of unanimity is perhaps even more evident in the field of environmental ethics itself, where the number of different perspectives that have emerged, has resulted in a pattern of vigorous and sometimes acerbic debate between the proponents of the various environmental ethical stances. Clearly this multiplicity of positions must (at least to some degree) pre-empt the emergence of a clear-cut set of guidelines for environmental practice, and thus seem to negate the posited value of philosophical theorising.

For those from a technical or scientific background, where theories are far more singular and in line with the 'facts' of the real world, this level of divergence apparent in ethical theorising may be disconcerting and discouraging. They may balk at this apparent lack of coherence, and interpret it as a lack of objectivity, a characteristic considered as sacrosanct by scientists and technicians.<sup>48</sup> From their scientific perspective they would expect that the postulation of a theory of ethics presupposes some sort of objective, and therefore (at least potentially) verifiable, ethical reality, even if as yet undiscovered. Some moral philosophers may even tend towards this view. In an article named *Realism*, Smith (1995: 399-410) debates the arguments for moral facts, and concludes that moral desires may yet, in time, concretize into moral facts. Also hinting at the objective reality of ethical values, Rolston states that

[s]omething from a world beyond the human mind, beyond human experience, is received into our mind, our experience, and the value of that something does not always arise with our evaluation of it. (1998: 84)

Apart from positing an ethical reality, another approach, a theological one this time, that attempts to negate moral ambiguity, is one which relies on moral rules inspired by divine decree. Statements such as, "God commands us to ...", or, "It is written in the Great Book (Bible) that you shall ...", suggest fairly clear-cut guidelines, and clearly do not invite any further debate. However these types of statements and arguments are of little meaning or value to those of a different, or no religious persuasion, and, according to Smith (1995: 409), may actually hamper the emergence of true moral realities. The multitude of religious faiths in the

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<sup>48</sup> In this text the designations, engineer, technician and technologist (and even scientist) are used somewhat synonymously to indicate persons who apply scientific and technical knowledge, and who generally may hold a technocentric (reductionist) world-view. Of course in the engineering context these designations do carry specific connotations, but these are not germane to the discussions here.

world in itself undermines the religious argument for ethical certitude. Hence in this study *divine command ethics*, based on divine fiat, will not be considered an adequate basis for ethics.

Similarly one could argue that the position of *ethical objectivism* or *realism* with its postulation of an ethical reality, and hence moral authority, stands contradicted by the apparent diversity of ethical theories in philosophical texts, and the continuing debate amongst philosophers around ethical norms and their justifications. And so, in the face of this lack in a self-evident moral uniformity, Smith, his yearning for a moral realism notwithstanding, has to acknowledge that “it remains to be seen whether [in time] sustained moral argument can elicit the requisite convergence in our moral beliefs ... to make the idea of a moral fact look plausible” (1995: 409). Thus, for the moment, the claims of an objective ethical reality remain unsubstantiated, and it may seem that, at best, the theorists have as yet not delved deep and long enough to uncover and agree on some ethical reality. At worst, as argued by relativists, this objective of a universal ethical reality is nothing but a myth. In recognising this problem Des Jardins has the following to say:

We should also be careful not to ask too much of ethical reasoning. Few controversies that we examine in ... [the ethical arena] can be resolved with moral certainty. It is tempting to think that if ethics cannot "prove" a conclusion beyond doubt, no objective conclusion exists. But this standard of proof, perhaps applicable in mathematics and a few other areas, is surely inappropriate in ethics. (1997: 20)

Despite Des Jardins' mitigative plea, the absence of a clear demonstration of an objective ethical reality, forces one to confront the stance of *ethical relativism*, which compared to ethical realism, is at the other end of the spectrum. According to this stance ethical outcomes are not based on universal, immutable truths, but instead are contextually determined. (See Wong, 1995: 442-450.) This means that ethical outcomes may depend on a society's cultural or religious preferences, or even on individual choice, all of which may vary from one context to another. And so Wellman, for example, can conclude that that which “cause[s] people to arrive at different judgements of right and wrong is the process of enculturation by which they absorb the mores and values of their respective societies” (1988: 274). Thus, when observing that different cultures and religions across the world adhere, with conviction and faith, each to their own value systems, which may differ from each other to a larger or lesser degree, one has to admit that the argument for cultural relativism seems convincingly reasonable. An observer, when faced with the serious, seemingly unresolvable, ethical conflicts evident in modern

societies (for example, the moral arguments for and against abortion, or in the environmental context, arguments for and against, say, a new road through a pristine area), and when the observer concludes that the intractability of these conflicts resides in the differing cultural or religious values held by the opposing protagonists, he or she might well feel constrained to concede that moral relativism is *the* reality. Pushing these arguments to the extreme, the post-modern ethical relativist may even put forward the claim that ‘whatever goes, goes’, a position of *moral nihilism* – a sort of moral free-for-all – where nothing is either right or wrong. However having ventured so far down the path of ethical relativism, one senses a rising contradiction. Our intuition and our own experience both seem to deny such a vacuous position. For example, it seems highly unlikely that any reasonable, sane person will contend that actions such as rape and murder are neither right nor wrong. Furthermore the nihilist’s moral indifference must, in the final instance, apply even if it is his or her own family, or loved ones, who are the victims of these foul misdeeds (such as rape and murder) – clearly a wholly unthinkable position (Rachels, 1995: 434). The lurking absolutism inherent in nihilism is its own defeat.

If one thus concludes that the model of moral nihilism is untenable, one may still argue the case for a softer cultural based relativism. For example, if in one culture animals are accorded little inherent value (a stance which then may permit such practices as bull fighting or whale hunting), but in other cultures animals are intrinsically valued and as such accorded respect or even holiness, who is to say which culture is right or wrong? The cultural relativist would argue that each of these ethical stances are equally valid, each within its own cultural context. However, in contrast, one may argue that even though cultures may hold different moral prescriptions, this does not necessarily imply that these various prescriptions are equally valid. Wong argues that “diversity in belief is no disproof of the possibility that there are some beliefs [which are] better to have than others because they are truer or more justified than the rest”, and thus while he “holds that there is no single true morality, yet [he] does not deny that some moralities might be false and inadequate” (1995: 444, 446). Rachels contends that *simple subjectivism*, which is the assumption that a moral assertion by a person merely reflects his or her approval or disapproval of some or other behaviour, cannot adequately explain why we can sometimes be persuaded about the rectitude or wrongness of our moral assessments, or why we may strenuously argue with each other about them (1995: 435). Clearly the majority of us do

not live our lives as though moral issues do not matter, and hence do not need to be discussed and evaluated. Rather we live as though some choices are ethically better than others – we praise “friendship, love, freedom and democracy while condemning hatred, murder, slavery and totalitarianism” (Des Jardins, 1997: 20). And so, while ethical consensus may elude us, the ensuing vigorous ethical debates give lie to a position of bland relativism.

But having argued that some moral rules and ethical standards are more valid than others, we are still faced with the prevalence of much ambiguity, uncertainty, and disagreement in the moral arena. Singer admits that he (as all of us) has “a personal perspective on the world ... [and that] reason enables [him] to see that others have similarly subjective perspectives, and that from ‘the point of view of the universe’ [his] perspective is no more privileged than theirs” (1997: 272). But he nevertheless does argue for some degree of ethical objectivism, which he expresses as follows:

... I am not defending the objectivity of ethics in the traditional sense. Ethical truths are not written into the fabric of the universe: to that extent the subjectivist is correct. If there were no beings with desires or preferences of any kind, nothing would be of value and ethics would lack all content. On the other hand, once there are beings with desires, there are values that are not only the subjective values of each individual being. The possibility of being led, by reasoning to the point of view of the universe provides as much ‘objectivity’ as there can be. (1997: 275)

Thus it appears that those morals which reflect “the point of view of the universe” are more objective and valid than our own personally held values. Most engineers and scientists, schooled as they are in objectivity, would probably find even Singer’s level of objectivity uncomfortable. The amount of imprecision in moral debate would tend to confirm their positivist<sup>49</sup> rejection of ethics as a legitimate field of investigation. They might read even more into Wong’s lament than he intended, when he concluded:

What is left is a moral reality that is quite messy and immune to neat solutions. But why should we have expected anything less? (1995: 449)

Notwithstanding Wong’s less than optimistic assessment, and recognising the technician’s yen for objectivity, one may still be able to draw some tentative conclusions from the foregoing discussion. On the one hand, the co-existence of the various ethical theories and differing moral

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<sup>49</sup> A positivist would insist that knowledge can only be gleaned from *concrete* facts.

frameworks may seem to confute a stance of ethical objectivism, but on the other hand, a position of extreme relativism, is negated by the moral preferences evident in our lifestyles. And so, almost inevitably, some middle ground seems most reasonable,<sup>50</sup> suggesting that a position of some sort of moderate relativism may not only be logically tenable, but also provisionally acceptable.<sup>51</sup> Thus by eliminating the extreme ethical positions, one may hope for less debate of the unproductive, interminable theoretical kind, and rather, that such theorising, as does take place, leans more towards the kind which is outcome focussed and practice oriented. This will be the approach favoured in this study in the belief that it would be of more direct benefit in promoting environmentally sound practice.<sup>52,53</sup>

### 2.1.3 Science and ethics

While the value of philosophy in identifying and justifying ethically sound environmental practice is being asserted here, the science model, with its claims of superior accuracy and non-ambiguity, remains hovering in the background. A perception exists that science is pure, factual and value-free, and that as such it is not open to (and even above) philosophical enquiry. Philosophy, and in particular philosophical ethics, is intimately concerned with values<sup>54</sup> which are, as has been concluded, to some degree contextual. Values lack objectivity, and may even be tied up with emotions – they are not the stuff of rigorous, scientific research (Vesilind & Gunn, 1998a: 32). If we require universal, lasting environmental solutions it is to science that we must turn. According to Des Jardins,

[f]or many people in our culture, and especially for many in policy-making positions, science and technology offer the only hope for solving environmental problems. (1997: 4)

Engineers, being trained essentially as applied scientists, might tend to share in this perception.

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<sup>50</sup> This approach echoes Aristotle's conception of virtue as a mean position on a bi-polar scale of human traits. (See §2.2.4.)

<sup>51</sup> See Wenz's argument for moderate pluralism (2003: 224-225).

<sup>52</sup> This position is akin to that of environmental pragmatism (which will be discussed more fully later), and at the same time is also somewhat reminiscent of Aristotle's idea of practical wisdom as explained more fully in §2.2.4.

<sup>53</sup> In this text 'environmentally sound practice' may be equated to the notion of sustainable development.

<sup>54</sup> Values are assumed to be the ground of our morals and ethical views.

As is the case with scientists, they practice under the ubiquitous positivist paradigm of the scientific method. They see themselves as pragmatic appliers of objective knowledge, which is free from the subjectivity of value judgements. According to Florman (as quoted by Vesilind & Gunn)

engineers have the freedom to concentrate on their job, unfettered by monetary and *social* concerns. Engineers do not make the decision to build the dam, for example, but are simply asked to design and construct it, thus freeing them to perform the technical task for which they were trained ... (1998a: 27-28; [emphasis added])

Working in the field of 'hard' sciences, where objectivity rules supreme, they view the social sciences as still developing towards this ideal, and thus still, to some degree, 'contaminated' by subjectivity. As the philosophical nature of the ethical questions raised previously, evade the structure and precision of traditional scientific theories and engineering analyses, there may be a tendency in technical circles to avoid, or ignore these questions, or to regard them as being irrelevant to scientific and engineering practice (Vesilind & Gunn, 1998a: 32).

Positivists hold that ... all value judgments are subjective and unreliable, ... [and hence] do not constitute 'proper knowledge'. By positing the 'naturalistic fallacy' they claim that it is not possible to infer 'ought' from 'is', the *prescriptive* (value) from the *descriptive* (fact). (Sterling, 1990: 79)

The inclination of technicians to avoid value issues may be reinforced even further when they are confronted by relativist claims that ethical values are culturally determined. Given this 'fact', the scientist/technologist will then feel vindicated in his or her withdrawal to the field of 'pure' science, where decisions and justifications are made in a value-free structure. In this value-free world problems are simply solved by producing yet more and more science and technology, or by increasing the sophistication thereof. (See Vesilind & Gunn, 1998a: 26-36.) The positivist influence can be invasive over a broad front; it is evidenced in "a bias in favour of thought over feeling, reason over emotion, fact over value, intellect over intuition, analysis over synthesis, instrumental over intrinsic goals, and quantitative over qualitative factors" (Sterling, 1990: 78).

However a deeper investigation into the proposed scientific solutions reveal that they are in fact not value-free, but have covertly implicated in them the values of the science practitioners, their sponsors and others. Thus Stevenson, as paraphrased by Botzler & Armstrong, argues that:

... scientific research cannot be value neutral because, as a human activity, it constantly

involves choices of how to spend time, energy, money, and other resources. Since all these resources are limited, the scientist's personal values contribute significantly to the choices made. (Botzler & Armstrong, 1998: 10)

As the sponsors of scientific research generally only support research that suits *their* needs, one may similarly find their values emerging surreptitiously in the research outcomes (Stevenson, 1988: 26-27). Furthermore, the values embedded in prior research, and in the publishers' preferences also play a role. Des Jardins (1997: 6-7) shows how the values underlying the mechanistic, reductionist models of the physical sciences may often be inadequate to deal with real world problems on a holistic basis. He suggests further that the greatest weakness in the value-freedom claim of scientific practice lies in the inability to ask the right questions. Speaking of conservationist scientists, Palmer maintains that they, while "[h]iding behind the presumed objectivity of science, ... have failed to understand that in their missionary urge to save the world they carry with them a host of cultural presuppositions. Some of these are the conceptual seeds of the very forces of destruction they seek to halt" (1990: 51).

The values which may underlie many scientific endeavours, such as those referred to here above, have been characterised as *contextual* values. They arise from the social and cultural context in which the scientist operates. But there are also other values implicit in the *how* of scientific practice, which may be termed *constitutive* values. They are "the source of the rules determining what constitutes acceptable scientific practice or scientific method" (Longino, 1990: 4). Larson contends that while the traditional, value-free model of science intends

... that contextual values, including social and religious influences, [are to be] kept out of science by [the] constitutive values that [hold] within science itself ... , it is [unfortunately] impossible to draw such a firm line between contextual and constitutive values. A key constitutive value is objectivity, yet even the desire to be objective reflects particular contextual values. (Larson, 2007: 949)

In the same vein Hattingh urges invasion biologists to "acknowledge explicitly the role of values in the ... activities that ... [they] engage in to arrive at their definitions and criteria" (2010: 373). While the views of Hattingh and Larson (a conservation biologist himself) are articulated within the context of invasion biology, Longino addresses the broader scientific endeavour by asserting "that the social and cultural stakes of the outcomes of [scientific] research can themselves affect the norms and constraints governing it" (1983: 16). Many scientific philosophers would agree with Larson that the value-free scientific model, based on

a mutually exclusive “fact-value dichotomy”, is conceptually flawed simply because “there is no way to isolate our facts from our humanness” (2007: 949).

Thus it is a myth to believe that scientists and technologists operate in a value-free structure. Indeed, as human beings, we are all ‘condemned’ to operate from a certain world-view perspective (our own), whether we like it, or even are aware of it, or not. And this world-view will include certain basic values from which our ethical framework is derived. Consequently technicians will have to recognise that their scientific insights are tempered by their in-built ethical sensitivities, and need to accept that technology cannot be separated from ethics. In the words of Des Jardins, we need “to recognize that both science and ethics are essential if we hope to make meaningful progress in meeting the environmental challenges that confront us” (1997: 9).

Many times when engineers proceed in doing things ‘their way’ they may encounter opposition, and may then feel that they are unreasonable being painted as “villains” and “tools of the establishment” by the public in general, and by environmentalists in particular. Vesilind & Gunn (1998a: 26-30) suggest that this may be due to the different way in which engineers view themselves as opposed to the way in which the public views them. Engineers, operating largely within the utilitarian<sup>55</sup> tradition, where the maximum benefit for the greatest number of people is sought, may often, as a result, appear to be indifferent to the plight of individuals or the natural environment. The utilitarian approach may inevitably result in some individuals being disadvantaged in favour of the benefit that accrues to the majority. For example some persons and their homes may have to be moved in order to accommodate a new development. So while engineers may see themselves simply as agents implementing the public good, the public in general, and in particular those persons who are negatively affected by developments, may see their utilitarian approach as being essentially unfair, and hence may view engineers in a far less favourable light. Similarly, environmentalists may see the engineers, for example those building a new dam, not so much as contributing to the benefit of the larger populace, but rather as “despoilers of the environment” (Vesilind & Gunn, 1998a: 29).

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<sup>55</sup> In later sub-sections this and other ethical traditions will be treated more fully.

Clearly the perception that the practice of engineers is ‘purely scientific’ and therefore value-free cannot be sustained. From the perspective of this study, engineers could do worse than delve into a study of ethics in general, or environmental ethics in particular. In so doing, it is suggested here, they will be able to, not only develop new ethical insights which could be used to screen the application of new technologies, but in line with the objectives of this study, they will also hopefully be able to ensure that their practice in general remains defensible from an ethical and environmental ethical point of view.

In the broader context of a modern world dominated by science and technocentric approaches, Engel (1990: 6-8) suggests five reasons why ethics could play a significant role. Firstly, having affirmed the myth of value-freedom in scientific endeavours, ethics can help us to understand and evaluate the moral underpinnings of our cultures. Secondly, it also helps us to understand the moral ideals that motivate not only us but also the moral leaders of our societies. Thirdly, with the aid of ethics we are able to clarify the values that inform policy decisions and are also able to give moral reasons for alternative courses of action. Fourthly, and in line with the theme of this study, we can expect ethics to aid in the resolution of the value conflicts between conservation and development, not necessarily by proving one side right and the other wrong, but by expanding understanding so that actions which attempt to reconcile the opposing positions can be developed.<sup>56</sup> Fifthly, one would look to the role that ethics could play in helping to define a new social paradigm which will promote sustainable development across the world.<sup>57</sup>

#### **2.1.4 Conclusion**

It has been demonstrated in the preceding sub-sections that, even in the context of engineering and science, ethical questions are relevant and of importance, and thus that environmental ethics may provide valuable insights towards the resolution of the environmental dilemma, which crudely put, pits development against conservation. It is thus apposite to now consider the field of environmental ethics, in greater depth, and in so doing to hopefully lay the

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<sup>56</sup> This theme will, in terms of civil engineering practice, underpin the discussions in Chapter 10.

<sup>57</sup> This theme will be further developed in Chapter 4.

theoretical groundwork for a more sound approach to environmental practice. But such a study into the core issues of environmental ethics should logically be preceded by a study of ethics itself. And so the next sub-section will be devoted to an overview of the most relevant traditional ethical theories – relevant, that is, in terms of the aims of this study.

## 2.2 TRADITIONAL ETHICAL THEORIES

As has now been concluded above, philosophical theories of ethics *can* provide some useful guidance or relevant insights in those problematical practical situations, where ethical issues are at stake. In the very least they can provide a common language to facilitate the ethical discussion. As has also been stated, ethical theorising may be able to expose the underlying ethical patterns and assumptions inherent in our prevailing world-view, which may in themselves be contributing to the environmental problems that we want to solve (Des Jardins, 1997: 18). This was White's (2003) line of reasoning when he claimed that the roots of the present-day environmental crises of the world lie in the Christo-technological heritage of the West.<sup>58</sup> A good grounding in ethics could assist one in evaluating the merits of White's claim.

Having thus reiterated the value of ethical theorising in clarifying ethical options in practical situations, and also in uncovering covert determinants in our attitudes towards the environment, we can now move on to a deeper discussion of ethics. The discussion is introduced by providing an overview of some of the traditional ethical theories, that may have relevance to the objectives of this study.

### 2.2.1 The natural law tradition

According to Des Jardins (1997: 20-22) Aristotle's discourse on the proper relationships between humans and nature is one of the oldest systematic attempts at describing what may be termed an environmental ethic, and it has become known as the *natural law* or *teleological* approach. For Aristotle there was no great distance between science and ethics and his

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<sup>58</sup> Naturally there are some who dispute White's conclusions. Park (1991), for example, while acknowledging the feebleness of the Christian response to modern environmental concerns, still argues forcefully that stewardship of and care for our natural heritage is fundamental to the Christian faith.

reasoning for an ethical approach arose from a biological base. Each object, he reasoned, had a hierarchy of “causes” for it to be properly fulfilled and understood. It is right and proper for each object to achieve its highest or “final” cause, its characteristic activity or purpose, its “telos”. For example, the purpose of a table, in its broadest context, is to provide a working surface, and it can only be fully understood if one recognises this purpose. Thus, in general, the fundamental *good* is that all objects, including a table, realise their final purpose or “telos”.

Thomas Aquinas tried to reformulate the teleological approach of Aristotle in Christian terms. God, having created the world and all the creatures therein, ordained the final cause and the characteristic activity of all objects and living organisms (Des Jardins, 1997: 22). However, as humans are characteristically rational beings, *reason* lies at the heart of the natural law tradition:

For Aquinas, the natural law is natural because it is in accord with human nature, and this nature is a rational nature. (Buckle, 1995: 165)

And so Thompson arrives at the following definition:

‘Natural law’ is the rational consideration of the final purpose of everything in nature, and the conscious shaping of action to bring it in line with that purpose. (1995: 140)

From this brief overview of the natural law tradition one may conclude that some conservationists within the environmental movement might feel comfortable with this foundational stance. In the regularities and balances that occur in nature, they will perceive natural law<sup>59</sup> at work, and would argue for recognition and non-interference in these workings.<sup>60</sup> Similarly those that promote the moral considerability of living things (or systems) could also root themselves within the teleological tradition, arguing that it is right to maintain the integrity of the natural order, as by so doing we allow each creature (or system) to achieve its “final” (God-given) purpose (Des Jardins, 1997: 22-23).

Des Jardins also lists some arguments against the teleological position. He notes the difficulty

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<sup>59</sup> The natural law tradition is not synonymous with the laws of nature as discerned by scientific investigation.

<sup>60</sup> The charge of committing the *naturalistic fallacy* (i.e. obtaining “ought” from “is”) in the natural law tradition, may be countered by claiming that the final ends are God-given (Thompson, 2006: 52-53), or that the naturalistic fallacy is itself a fallacy (Norton, 1996: 25).

teleologists have in determining the characteristic activity or final cause of higher order beings. For example, the purpose of the heart of an animal is to pump blood through the organism, but what is the purpose of a human being (Des Jardins, 1997: 23)? When the natural law tradition describes acts as inherently right or wrong according to whether they contribute or not to the final purpose, it can run into problems if a given act has multiple purposes (Thompson, 2006: 54-55).<sup>61</sup> In general terms the problem is one of “how to translate abstract claims about the existence of natural, rational ... [causes into] useful ... practical rules” (Buckle, 1995: 166). A further problem for those within the natural law tradition is the difficulty they have in trying to explain the good of some natural, but harmful occurrences, such as, for example, earthquakes and floods, or the good of some harmful organisms such as disease causing viruses. Finally it is evident that the evolutionary theory can provide an adequate explanation for the way things are in nature without having to resort to final purposes or God-ordained laws (Des Jardins, 1977: 23).

Despite said objections, some environmental thinking remains rooted in the teleological tradition, and engineering practice, with its emphasis on the adaptation and modification of the natural environment, would almost, it seems, by definition be in conflict with this thinking. It will be shown that engineering practice fits much more comfortably into the utilitarian tradition which will be considered next.

### 2.2.2 Utilitarianism

As the natural law tradition finds its roots in antiquity, so too does the *utilitarian* tradition also have ancient antecedents,<sup>62</sup> but it has been more recently formalised in the nineteenth century writings of Jeremy Bentham and John Stuart Mill, and developed into an ethic that underlies many modern day practices. For example, contemporary public policy is often formulated in utilitarian terms. Utilitarianism is based on a form of consequentialism, that is to say that the rightness or wrongness of an action does not depend on the action itself but on the outcomes or consequences of that action. In essence the utilitarian credo may be expressed as:

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<sup>61</sup> For example the final purpose of the sexual act may be seen as procreation, but clearly it could also serve the purposes of pleasure or of deepening relationships.

<sup>62</sup> Epicurean hedonism may be seen as a forerunner to the more modern utilitarian tradition (Thompson, 2006: 63).

If the act tends to maximize good consequences, it is an ethically right act; if it does not, the act is ethically wrong. (Des Jardins, 1997: 24)

In a seemingly more measurable form the utilitarian ethic can be formulated as:

Whenever we are in moral doubt, we should merely calculate which of our alternatives for action would result in the greatest amount of happiness for the greatest number of people. (Rossouw, 2002: 55)

The first step for the utilitarian is to define the sought after good, which Rossouw has characterised as happiness. Initially it was taken to be *pleasure*, which also equated to the absence of pain. This good, which can be considered to be objective and universal inasmuch we all recognise its presence or absence, and we all, as reasonable people, would welcome its presence, or feel deprived in its absence, is the basis of the so-called *hedonistic utilitarianism* (Des Jardins, 1997: 24-25). This approach may be criticised as being degrading to humans, as the simplistic pleasure seeking objective, interpreted as maximising physical pleasures, would lower us to the level of (the other) animals. Mill's response to this criticism was to include in his definition of happiness "mental pleasures such as learning, aspiring and caring" (Rossouw, 2002: 57). Thus humans would be able to rank their mental pleasures above their bodily pleasures, and also rank pleasures within these categories according to their own preferences, leading to the so-called *preference utilitarianism* (Des Jardins, 1997: 25). Newton (2003: 15) points to the strong link between utilitarianism and economics, as it is in the marketplace where human preferences are most unambiguously demonstrated. This may however also be a weakness; on what basis can preferences, manifested as market demands, be regarded as ethically normative? Indeed, many environmentalists would claim that it is in fact excessive market demands which lead to environmental degradation.

Des Jardins mentions several other objections that may be raised against utilitarianism (1997: 25-26). Firstly, one may identify the practical problem of trying to measure and compare different courses of action in terms of the amount of good that each can generate. The nature of the good (that leads to happiness) may often be qualitative, such as, for example, beauty, peace or contentment; characteristics which are difficult to quantify. And so if we are to maximise happiness, or other human preferences, how are we to measure these? To get around this problem attempts are made to have the inherent value of the good substituted by the instrumental value of something else that serves as an indicator of the primary good. Not

infrequently this indicator may be money, which then allows cost-benefit analyses to be used as utilitarian mensuration. However quite often the criticism against the use of the cost-benefit technique revolves around the inappropriateness of money as a measure of the good concerned. How can one, for example, express the beauty of nature in monetary terms? Further problems arise in terms of the scope of the measurement. Consider, as a case in point, airborne pollution which diminishes the public good of clean air. How far should one go in determining the preferences of people in this regard: locally, regionally, nationally or internationally? Thus the problem of the utilitarian approach in general is, in the words of Thompson, “that there is never enough evidence to provide certainty” (2006: 72).

To continue in the same vein; how does one assess the preferences of future generations, and how many generations into the future have to be considered? Indeed the whole idea of equity, whether across generations or within generations, is “alien to utilitarianism” (Dresner, 2007: 12). Further objections to the utilitarian approach focus on the utilitarian notion that no act can, in and of itself, be condemned; only the consequences of the act are subject to judgment. The logical outcome of this position is that the ends justify the means; an argument which may lead to quite intolerable situations in the eyes of many ethicists. Surely, they would argue, acts such as robbery and murder are intrinsically wrong, irrespective of their outcomes? In like manner it is argued that the utilitarian approach does not allow space for the considerations of fairness, justice, individual rights; and also the special obligations we feel towards those closest to us, such as our families and friends. Newton also points out that while the utilitarian approach may be extended to allow for the consideration of higher animals on the basis of their sentience, it fails in respect of the broader environment that includes also the lower level animals, plants, inanimate objects and ecological systems (2003: 16, 19).

As has been previously stated, the utilitarian logic, despite the said objections, often underpins public policy. Consequently it features quite largely in the engineering practice which flows from public policy, particularly in the case of civil engineering (Vesilind & Gunn, 1998a: 30-34). For example, engineers have often found it justifiable to displace a few people from their traditional land, and in so doing to deprive them of their property and maybe cultural rights, in order to locate a public utility on this land; a public utility that would serve the needs of many. Clearly, in deriving an appropriate environmental ethic for engineers, cognisance will have to

be taken of the dominance of utilitarian thinking in public agendas.

### 2.2.3 Deontology

If a great deal of modern ethical practice is founded in utilitarianism, it is countered by another widely spread ethical tradition, namely that of *deontology* on which much of the democratic *rights* movement is founded (Vesilind & Gunn, 1998a: 70-71). In contrast to the utilitarian approach which views actions as ethically neutral (the rightness or wrongness of actions being located in their outcomes), the deontological approach sees rightness or wrongness embedded in the action itself. Actions in which one fulfils one's duty are moral. To identify these actions the deontologist has a set of universal rules against which the rightness or wrongness of an action is determined, irrespective of what the outcomes of the action may be (Brody, 1983: 24). These rules reflect the duties to which we feel we are obligated.<sup>63</sup>

Probably the most influential deontological thinker was Immanuel Kant, who argued that if persons are to be held accountable for their actions, they needed to be free to choose various possible courses of action, and this freedom they gained through their ability to reason. Thus he maintained that our "standing as moral beings is derived from our nature as free and rational beings" (Des Jardins, 1997: 28). As rational beings we are able to determine the ethically correct course of action as that one which corresponds to a *categorical imperative* (Kant's term for a fundamental and universal principle or maxim). In Kant's words it is categorically imperative for one to "act only according to that maxim by which you can at the same time will that it should become a universal law" (Kant, 1994: 274). Thus, for example, the act of murder can categorically be outlawed, as no rational being will concede that murder could become a universally acceptable practice. It follows then that the act of murder is wrong irrespective of what benefits may flow from it. The categorical imperative also requires that all persons be treated as *ends* and not merely as *means* to an end.<sup>64</sup> At this point it may be appropriate to foreshadow the implication of this Kantian view in the arena of animal ethics. As a result of the intrinsic value that Kant places on rationality, and the belief that animals are not rational beings,

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<sup>63</sup> For example, consider the duties parents feel towards their children.

<sup>64</sup> In direct contrast the utilitarian approach sees the ends (consequences) as all important.

it follows that they may be treated as the means to an end. This stand may then of course lend a level of legitimacy to some dubious forms of animal treatment, such as may occur in animal experimentation and in the fur trade. While his theory seems to sanctify morally questionable actions towards animals, Kant still maintains that it is good to be kind to animals, but then only because it helps us to develop a general disposition of kindness, which in turn can benefit other human beings (Kant 1998: 312).

In the more modern era, and in the face of many dubious utilitarian applications, John Rawls has revisited the Kantian approach and proposed a *contractarian* version thereof as being a more just system. The main problem that utilitarianism fails to address is the inequality that exists in society and which may even be exacerbated by utilitarian applications. Rawls suggested that a more just system would be arrived at if the social arrangements of society were pre-selected by all individuals from behind a “veil of ignorance”, which implies that all individuals are, at the time of selection, ignorant with respect to the position that they will occupy in society.<sup>65</sup> From this position people would select a society which, on the one hand, would allow the broadest spread of civil liberties for each individual without encroaching on the rights of others to enjoy equal liberties, and, on the other hand, where inequalities would only be tolerated if they resulted in compensating benefits for the least advantaged. While Rawls is trying to address the equity issues that the utilitarians seemingly fail to identify, it does appear that in attempting to do so, he is making some assumptions about human nature (in terms of the choices that they would make) that may be debatable (Dresner, 2007: 122-124).

It has already been suggested that the roots of such notions as democracy and civil liberties, which are characteristic ideals of Western societies, are to be found in the deontological tradition (Vesilind & Gunn, 1998a: 70). In South Africa these notions find expression in, *inter alia*, the Bill of Rights of the South African Constitution. Although the Bill of Rights also has a clause covering the (natural) environment (Clause no. 24), it is phrased in such a manner that the right is attached to persons, and not to the environment *per se* (South Africa, 1996: 10). This approach can be categorised as *anthropocentric*, a position which favours the human

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<sup>65</sup> The so-called “veil of ignorance” means that people “would not know their place in society, their class, their natural abilities, the society’s level of economic development or what generation they lived in” (Dresner, 2007: 122).

perspective. Anthropocentrism will be explicated further in a later sub-section, but for the moment it may be noted that it is a position which many environmentalists would tend to reject, because, in their view, much of the stress which is presently being imposed on the natural environment, is caused primarily by anthropocentrically oriented human actions. But, it needs to be restated that perhaps the more fundamental problem (from an environmental perspective) with Kantian ethics, lies in its apparent inability to extend moral agency beyond the domain of humanity (Newton, 2003: 19). This is not to say that no attempts have been made by others to broaden the sphere of moral considerability. Regan (1995), for example, makes the case for rights to be extended to animals.<sup>66</sup> Problems still remain however in, for example, how far to extend these rights,<sup>67</sup> and in how to adjudicate the priority of rights between competing classes of rights holders.<sup>68</sup>

It may also be argued that the deontological approach lacks the clear-cut objective of utilitarianism. The question as to why we should obey moral rules can only be responded to, somewhat vaguely, by asserting that morality is good *per se*. There is also the problems that arise from conflicting moral rules. These problems may arise between the rules of different cultures, but also within a given culture.<sup>69</sup> By whose or what authority can moral rules become prescriptive? Maybe the notion that takes rules, whether they be deontological or utilitarian,<sup>70</sup> as fundamental, is flawed, and another point of departure is needed.

#### 2.2.4 Virtue theory

While out of a *mélange* of ethical traditions, utilitarianism and deontology appear to be the most dominant in modern society,<sup>71</sup> the resurgence of interest in the *virtue* theory, might to

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<sup>66</sup> In the next chapter on Environmental Ethics, Regan's approach will be touched upon again.

<sup>67</sup> Do fish, for example, also have rights?

<sup>68</sup> Do the rights accorded to animals weigh as much the rights accorded to human beings?

<sup>69</sup> For example, at present, there is considerable conflict in Christian and other circles as to whether the practice of homosexuality is moral or immoral.

<sup>70</sup> In order to avoid applying the utilitarian calculus to every action, utilitarians will accept, as a short-cut, rules provided they are based on utilitarian considerations. This is often referred to as rule-utilitarianism.

<sup>71</sup> While the utilitarian and deontological traditions may be dominant, neither can be said to be hegemonic.

some extent, indicate a backlash against the “hollowness” and “lack of compassion” evident in the dominant theories (Pence, 1995: 249, 252). From this assertion one might expect that the focus of the virtue theory will be quite different from that of the other theories mentioned, and indeed it is fundamentally different, its focus being on character traits rather than actions.

Ethical systems like utilitarianism, deontology, and natural law focus on human *actions*, and seek to defend some rule or principle that we use to judge whether those actions are right or wrong. Virtue-based ethics constructs a philosophical account of the morally good person, describing and defending certain character traits of that good person. (Des Jardins, 1997: 133)

Virtue theory, despite its recent revival, also has its roots in antiquity. This theory builds on Aristotle’s concept of the *telos* – the proper purpose of an entity. According to Aristotle, the proper purpose for human beings is *eudaimonia*, which can be described as happiness, or perhaps more appropriately, as human well-being. In part, the achieving of this *eudaimonia*, depends on developing the right characteristics or traits. It is these traits, or virtues that characterise the ‘good’ person. While some virtues are social in nature (e.g. being a good parent) and others are more personal (e.g. being honest), they are all cultivated on the basis of rationality. Our natural disposition is to express our traits either in excess or in deficiency, but it is by reason that we can rationally control this tendency, and instead aim rather to achieve some sort of mean position, that earmarks a ‘good’ person. Thus, for example, the mean between the extremes of foolhardiness and cowardice, equates to the trait of courageousness, a virtue that is characteristic of the ‘good’ person (Rossouw, 2002: 45-48).

Aristotle argues that while human beings are capable of living a virtuous life, it does not come about spontaneously, but rather that virtues have to be inculcated by habituation (Newton, 2003: 32-33). This implies then that the virtuous life has to be learnt, and has to be “lived-in” as it were, and if this proposition is followed through, it will have certain implications for engineering education and practice. One may now, for example, argue that it is imperative for the curriculums of engineering programmes at institutions of higher learning, to adopt ‘environmental awareness’ as a desirable characteristic trait of engineers. By prescribing ‘environmentally sensitive’ modes of engineering practice in environmental codes of conduct further opportunity is provided for this trait to be reinforced in engineers. In this way the potential for conflict between development and the environment, such as it may emerge in

engineering practice, may be reduced or even eliminated.<sup>72</sup>

For Plato the cardinal virtues (for statecraft) were wisdom, courage, temperance and justice (Newton, 2003: 28-29), to which Aquinas (from a theological perspective) added faith, hope and charity (Pence, 1995: 252). Three of the intellectual virtues articulated by Aristotle, designated in Greek as *epistémé*, *techné* and *phronésis* (1925: 1139b15-1140b30), can be seen to be of particular relevance to engineers. The first of these virtues, *epistémé* (or scientific knowledge), relates to fundamental knowledge derived from universal principles. In the words of Flyvbjerg:

*Epistémé* concerns universals and the production of knowledge that is invariable in time and space and achieved with the aid of analytical rationality ... [It] corresponds to the modern scientific ideal as expressed in natural science. (2004: 285)

The second of this set of Aristotelean virtues, *techné* (art or craft), relates to the practical knowledge required to create something new.

*Techné* is thus craft and art, and as an activity it is concrete, variable, and context-dependent. The objective of *techné* is application of technical knowledge and skills according to a pragmatic instrumental rationality ... (Flyvbjerg, 2004: 286)

It is not difficult to project these values onto the engineering vocation, which in effect, is often a combination of scientific and craft knowledge. But for Aristotle the dual virtues of *epistémé* and *techné* should be moderated by the third intellectual virtue, *phronésis* (practical wisdom or prudence), which not only combines the previous two, but moves beyond them. *Phronésis* is, in Aristotle's words, "reasoned, and capable of action with regard to things that are good or bad for man" (1925: 1140b5). Flyvbjerg contrasts *phronésis* with *epistémé* and *techné* as follows:

Whereas *epistémé* concerns theoretical *know why* and *techné* denotes technical *know how*, *phronésis* emphasizes practical knowledge and practical ethics ... *Phronésis* is a sense or a tacit skill for doing the ethically practical rather than a kind of science. (2004: 287)

Thus where *epistémé* entails knowledge that is constant and unchanging, and *techné* reasoned action to implement something in a particular place, and is therefore variable, *phronésis* entails

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<sup>72</sup> These ideas, as they relate to the engineering profession, are given further consideration in Chapter 10.

the insight to determine what is important to do in particular circumstances to attain *eudaimonia*, or well-being. As such, *phronésis* is not merely a mechanical application of abstract principles, or the execution of a predetermined calculation (a decision-tree or an algorithm), but rather a careful assessment of the circumstances in which one has to act, drawing on experience, to develop a sense of what must be done in these circumstances to be a good person, and to promote well-being. *Phronésis* thus entails an awareness and sensitivity to context that cannot be captured in a rule; it operates rather in a realm where we need insight when rules tend to break down. Clearly *phronésis* presents an ethical challenge for engineering practice (and particularly for those who claim engineering to be value free), and it is this challenge that this study is attempting, in part, to address.

From an environmental perspective Newton argues for a modern version of the virtue theory<sup>73</sup> that overcomes inherent shortcomings in the utilitarian and deontological traditions. Starting with the virtues held up by Plato, she explicates them within an environmental context (Newton, 2003: 29-30). She sees *wisdom* as including “the biological science of ecology ... as much as psychology”, both employed towards the ideal of a wide and inclusive view of nature and life, that equates to “thinking like a mountain” as Aldo Leopold described it (1970:137). By *courage* Newton understands “patience and perseverance ... [as] nature does not work according to human deadlines, does not produce on cue, and often seems to require service without reward”. The virtue of *temperance* will “tell us when we are asking too much for ourselves of a limited system of resources, and when we must leave things in place for future generations”. The virtue of *justice* “is the recognition that each part of a complex system has its role, and requires non-interference; each part must do its own job”. To these Newton (2003: 40), in summarising the thinking of more modern writers, adds the virtues of *simplicity*, characterised by the “pruning of material desires and intellectual conceits”, and *humility*, which implies a “standing back, [a] getting out of the way, [a] yielding [of] place”. Of simplicity she says that it is “the highest and the best [virtue, as it] ... alone has the range to integrate a whole and fulfilled human life with a sustained effort to protect the environment” (2003: 40, 99).

Notwithstanding her enthusiasm for a virtue-based environmental ethic, Newton (2003: 34-35)

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<sup>73</sup> While the discussion here overlaps into the field of environmental ethics which is the subject matter of the next chapter, it is presented here as a good example of a modern day version of the virtue ethics approach.

is not unaware of shortcomings inherent in this approach. For example, as virtues have to be inculcated this leaves one with the problem of the morally immature, whether by experience or culture. One may also query whether the above mentioned virtues will necessarily lead to environmental sustainability. Furthermore, if virtues are moulded in tradition how does one develop virtues in situations of rapid change, or where the traditional values themselves are required to change? But, although utilitarianism and rule-based approaches may aid in modifying our actions towards higher levels of environmental sensitivity, Newton (2003: 19-24) claims that they do not offer sufficient justification for the fundamental moral re-orientation, the “paradigm shift” that is required. There remain situations in which neither of the two traditional ethical systems seem to be able to address the environmental problems arising in these situations adequately. One may find, for example, that the justification of animal experimentation may lie exactly in its utilitarian benefits (for the greater good of many), or in its Kantian disregard for animals (by virtue of them not being moral agents). Thus, argues Newton, only by appealing to virtues such as justice, temperance and humility, can we mount a reasonable case against this practice. And even on a more emotive level she asserts that the virtue-based life is one of joy and inherent satisfaction, as opposed to the cold calculus of utilitarianism and the Kantian sense of deprivation (Newton, 2003: 35, 42).

### **2.2.5 Evolutionary ethics**

Evolutionary ethics cannot be called a *traditional* ethical theory in the sense as has been the case with the other theories. It nevertheless does have a strong historical flavour in that it sees our moral sense and basic ethical values emerging from our evolutionary roots, a notion that was prompted by Charles Darwin himself. He put forward the proposition,

... that any animal whatever, endowed with well-marked social instincts, the parental and filial affections being here included, would inevitably acquire a moral sense or conscience, as soon as its intellectual powers had become as well, or nearly as well developed, as in man. (Darwin, 1994: 44)

More recently Herbert Spencer formulated an approach known as *social Darwinism* which gained notoriety because, from a platform which “elevated alleged biological facts (struggle for existence, natural selection, survival of the fittest) to prescriptions for moral conduct ... [it validated] a policy of non-aid for the weak”, and thus gave credence to abhorrent social systems

such as Nazism (Schroeder, 2005: 2, drawing on Ruse, 1995). Apart from its unacceptable ethical consequences social Darwinism was also philosophically discounted on the grounds that it classically committed the “is-ought” error, that is to say it illogically drew moral conclusions (the “ought”) from existential facts (the “is”). Pigden described this error as follows:

A conclusion containing 'ought' cannot (as a matter of logic) be derived from 'ought'-free premises. ... Logic is conservative; the conclusions of a valid inference are contained within the premises. You don't get out what you haven't put in. Hence if 'ought' appears in the conclusion of an argument but not in the premises, the inference is not logically valid. (1995: 423)

The “is-ought” error is a challenge for all versions of evolutionary ethics. According to Ruse

... Moore ... in his *Principia Ethica* ... [argued] that all who would derive morality from the physical world stand convicted of the “naturalistic fallacy.” Explicitly Moore noted that the evolutionary ethicizer is a major offender, as he goes from talk of the facts and process of evolution to talk of what one ought (or ought not) [to] do. (1986: 97)

If Spencer’s errors led evolutionary ethics into the doldrums, there has since been, despite the above objections, a modern revitalisation of evolutionary thinking in ethics which has its roots in *sociobiology*, an approach that was popularised by E. O. Wilson, and which in essence aims “to find valid regularities in the social behaviour of animals and humans” (Schroeder. 2005: 2). To get around the misanthropic ethics of Spencer, the modern approach recognises that our evolutionary history is not rooted only in conflict (survival of the fittest), but also in cooperation. Ruse argues that

... if my conspecific and I battle until one is totally vanquished, no one really gains, for even the winner will probably be so beaten and exhausted that future tasks will overwhelm. Whereas, if we cooperate, although we must share the booty, there will be no losers and both will benefit ... All such cooperation for personal evolutionary gain is known technically as “altruism”. (1986: 97)

To get around the “is-ought” dilemma, Ruse argues that the notion that the “ought” (ethics) is from a separate realm than that of the “is” (fact), is an illusion. He contends that moral claims “are no more than subjective expressions, impressed upon our thinking because of their adaptive value” and hence the idea “that morality has ... [a] philosophically objective foundation ... is just an illusion” (1986: 102). Callahan counters the naturalistic fallacy as follows:

Since “is” is all the universe has to offer, to say that it cannot be the source of an “ought” is tantamount to saying a priori that an ought can have no source at all – and to say *that* is no less than to say there can be no oughts. That cannot be correct ... (1996: 21)

Given these counter arguments, and notwithstanding the challenges it still faces (Schroeder, 2005: 4),<sup>74</sup> evolutionary ethics emerges as an approach that may overcome at least some of the problems that cling to the other traditional ethical theories. While the idea that our moral sense, and maybe even our moral norms are rooted in our evolutionary history, brings with it a sense of flux that is not evident in the other theories, evolutionary ethics also brings a different angle of approach. The previously discussed theories seem to have in common an approach that focusses on trying to determine *how* one can achieve ethical good, whether it be through the application of a utilitarian calculus, the following of a deontologically determined set of rules, or the inculcation of morally desirable traits. From this one may then deduce that if one theory is considered to be better than another, it would on the grounds of its ability to better describe *how* the ethical good can be attained. By contrast the evolutionary ethics approach is more interested in the ethical good itself – where does it come from, and what is it in essence?

A clue as to the source of the ubiquitous moral inclination of human beings may be found in the question, “Why do human beings exhibit moral behaviour, and animals do not?” There appears to be no reason why one should not believe that the moral sense evident in our species, *Homo sapiens*, evolved in much the same way as we have evolved in other respects to be mentally and physically different from other animals. This leads to the fundamental tenet of the evolutionary ethics theory, which contends that ethics is not a given, waiting to be discovered, but that it is an awareness which has emerged from our evolutionary history to be a characteristic peculiar to human beings (Shermer, 2005: 24-64).

Shermer describes and depicts this ethical evolutionary history as a bio-cultural evolutionary pyramid, that is not dissimilar to Maslow’s hierarchy of needs (2005: 47-49).

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<sup>74</sup> Included in Schroeder’s list is the problem of moral actions that go beyond reciprocal altruism, and the idea that true altruism demands universal application as opposed to the evolutionary rooted favouring of the family or the group (2005: 4).

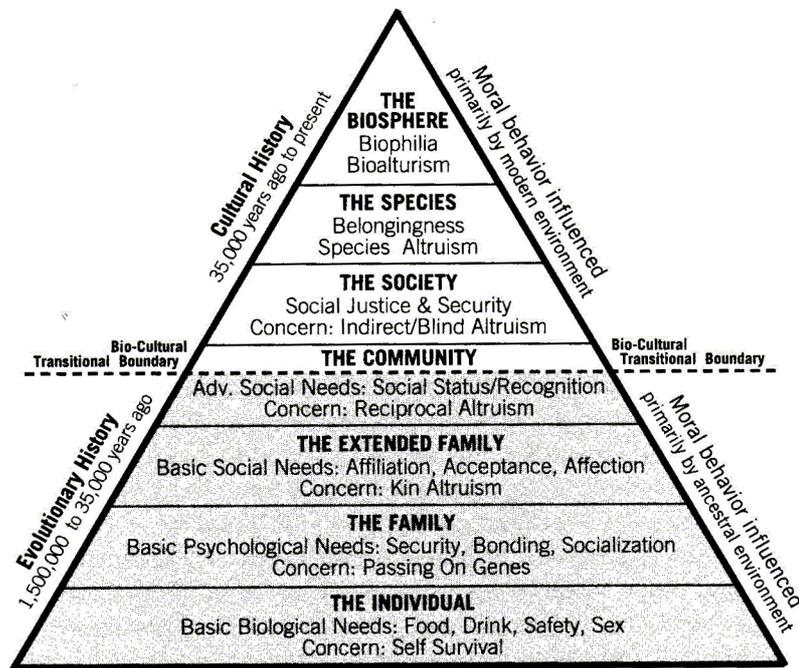


FIGURE 2.1: BIO-CULTURAL EVOLUTIONARY PYRAMID  
(Shermer, 2004: 48)

This model suggests that our moral *development* is the product of two influences; initially biological determinants dominated our ethical evolution, but then these were later overtaken by cultural factors. These two influences have combined to result in a binary constitution of our ethical givenness, that reflects these originary influences. Firstly, there is the *moral sense* itself, that is manifested as an apparently universal human capability. It seems that everyone, except perhaps some who are mentally afflicted, or the very young, has the evolved ability to moralise. But while this moral sense has evolved over eons of time in human beings, it has not been the case, at least not very noticeably so, in other animals. (It is on this basis that some ethicists attempt to exclude animals from moral consideration.) In theory our moral sense is still evolving, but because biological evolution is so slow it is highly unlikely that we will be aware of any of the changes brought about by this determinant.

The second characteristic of our ethical givenness could be called *moral content*. While its biological roots are somewhat hidden, it is evidently quite heavily influenced by cultural determinants. Because human cultures differ across the globe, our moral content, or in short, our morals, also reflect many differences. Furthermore because cultural evolution is fairly rapid,

compared to biological evolution, we can expect that changes in our morals could occur over time spans well within the experiential time spectrum of humans. One could, for example, use this cultural evolutionary approach to explain the fact that slavery, which once was considered generally acceptable, has now become taboo.

In summary one can then say that the Shermer bio-cultural evolutionary model can account for the fact that the moral sense is a universal human characteristic, and also for the fact that the content of our morals can vary across cultures and also across time spans. Because of this last fact, the evolutionary model still leaves us with the problems caused by the moral diversity. In response to this problem Shermer proposes an approach, called *provisional ethics*, which argues that the binary approach of being *either* right, *or* wrong, is too restrictive, and that some things may be partially right and partially wrong (2004:166-168). For example, when considering our moral obligations towards animals, the dilemma has always been which animals to include within the circle of moral considerability – that is to say, where to draw the line between inclusion and exclusion? Singer (1995: 52) proposed the criterion of sentience, but then, if sentient animals are considered to be morally worthy, do they then earn the same consideration as human beings? The binary model of “in” or “out” seems to imply that if they are “in” then they should enjoy the same levels of consideration as human beings, as suggested by Singer (1995: 52). Shermer judges the binary approach to be inadequate and in its place puts forward a fuzzy logic model. This system is analogous to statistical models where a hypothesis may be accepted on a (say) 95 % confidence level (or a 0,95 level on a scale of 0 to 1). In a similar manner (but not based in statistics) the fuzzy logic approach could grant an activity a provisional moral status of somewhere between 0 (no moral status) and 1 (full moral status). It is provisional in the sense that with more information available the original assessment could be revised. Based on the work of Wise (2003) Shermer applies this model to animal rights by allocating rights on the basis of cognitive and other skills. As a result animals can be placed in one of four categories. For example, elephants would then fall into Category 2, a grouping of organisms which, on scale from 0 (no rights) to 1 (full human rights), warrant liberty rights of between 0,51 to 0,89 (Shermer, 2004: 168-169; 215-221).

Apart from obvious disadvantages evident in this approach, such as the fuzziness of the category boundaries, the difficulty of trying to translate a partial allocation of rights into

something meaningful, the in-built anthropocentrism, and the reduction to quanta, some might simply find the approach too mechanistic and simplistic. In addition it certainly cannot (at present) claim to have anything close to the level of widespread acceptance needed for it to qualify as the standard norm. Nevertheless it does suggest a level of rationality and pragmatism that will resonate with another approach to be put forward later (see §3.2.2).

Leaving aside the provisional ethics approach for the moment and returning to the basic bio-cultural evolutionary model, the question of whether this theory has any contribution to make towards solving the environmental dilemma, is still open. A closer look at this model does suggest that there might be some possibilities in this regard. It could be argued that the fairly universal phenomenon of religion is in itself an evolutionary product (Dawkins, 2006b: 163-207; Boyer & Bergstrom, 2008), which arose from the evolving sense of self-awareness in humans, which gave rise to such questions as, “Where do I come from?” and, “Why am I here?” While it appears, in some parts of the West at least, that the religious influence has waned, it may not be too far-fetched to suggest that religions in their quest for moral certitude and authority have contributed to some of the human morals that are reasonable widely held. Be that as it may, Shermer has identified a list of more than 200 “human universals ... [that are] related to religious and moral behavior” (2004: 285-292). But more importantly he also affirms that the so-called “Golden Rule”<sup>75</sup> is at the base of “most human interactions and exchanges and it can be found in countless texts throughout recorded history and from around the world – a testimony to its universality” (2004: 25-26). This universality of some of the moral “human universals”, and particularly of the “Golden Rule”, leads one to suspect that more than cultural determinants are at play here, and that possibly, at the foundation of these universals, there might be a genetic root. The bio-cultural model acknowledges even in its biological base the emergence of altruistic traits. Shermer sees it like this:

... we can presume that there is a genetic predisposition for these traits to be expressed within their respective cultures, and that these cultures, despite their considerable diversity, nurture these genetically predisposed natures in a consistent fashion. (2004: 60-61)

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<sup>75</sup> There are many versions of the Golden Rule. The following one is ascribed to Confucius: “What you not want others to do to you, don’t do to others” (Shermer, 2004, 25). A Biblical version reads as follows: “And as ye would that men should do to you, do ye also to them likewise” (Luke 6: 31). (Technically these two examples might respectively be termed ‘negative’ and ‘positive’ versions of the Golden Rule.)

The important conclusion for this study is that the primitive levels of altruism in our evolutionary history have evolved into the universal “Golden Rule”, and that this is about as close as one could come to an absolute ethical standard. This idea will be picked up on in Chapter 4. It may be said that in Leopold’s view the “Golden Rule” ethic would (and should) evolve into a much wider environmental ethic (the land ethic as he calls it):

This extension of ethics ... is actually a process in ecological evolution ... There is as yet no ethic dealing with man’s relation to land and to the animals and plants which grow upon it ... The extension of ethics to this ... element in the human environment is, if I read the evidence correctly, an evolutionary possibility and an ecological necessity. (Leopold, 1970: 238-9)

Before closing this sub-section it might be interesting to briefly pick up on another insight around our evolutionary heritage. While environmental ethics is a relatively young field of study, it is worth considering that indigenous people might possess ancient environmental wisdom that is lost to us because of our enculturation into the Western technocentric mind-set.

Based on the work of Goldsmith, Humphrey postulates a

coevolution hypothesis [which] tells us that we are uniquely adapted to achieve cognitive certainty about the environment in which we have evolved ... [that is] the natural environment that has surrounded our evolutionary development for millennia – the biosphere, not ... the “technosphere” of the modern world. It is this environment that we instinctively understand and are adapted to. It is also in this, and only in this, environment that we can expect our behaviour to be “homeotelic” – that is, having the crucial ecological property of contributing to the stability of the biosphere, which itself constitutes ... [a] test of the rightness of an action. (Humphrey, 2003: 55)

What one may take from this, is that our intuitive (read evolutionary) ethical notions, to the extent that we can separate them from those that spring from our culture, may contain the sense of oneness with the environment that not a few environmental theorists see as a pre-condition for our survival.

## **2.2.6 Which ethical theory then?**

In the light of the brief overview of ethical theories given above, and the inconclusive outcome as to which is the most correct or acceptable theory, one may return to the question of the usefulness or not of ethical theorising. The problem is exacerbated when, even within a single theory, one cannot clearly identify the most ethically correct course of action, in a situation

where two or more such courses of action, each of which seem ethically in congruence with the theory, are possible. This may, for example, be the case in the South African debate on the death penalty (and maybe even crime in general), where the rights of the victims and their families are pitted against those of the perpetrators. If, in the present politico-legal environment, as some would argue, the rights of the victims, and society in general, are downplayed in favour of those of the perpetrators, which theory could one use to find the right balance?

A further degree of ambiguity and complexity emerges when different theories suggest, as ethically acceptable, differing and sometimes clashing courses of action. For example, utilitarians could find mining in a national game park acceptable, because it would increase human well-being in general. Deontologists, on the other hand, might argue for the rule that game parks are sacrosanct, as we have a duty to preserve them for future generations, and hence that mining and other industrial activities in game parks are simply not acceptable. In using such scenarios to demonstrate the advantage or disadvantage of one theory over another, there may be a tendency by theorists to slug it out, metaphorically speaking, somewhat interminably, on a theoretical level. But meanwhile, in the business of daily living, and particularly also in the environmental arena, practical activities have to proceed, with or without the benefit of theoretical insights. In such situations the “disparity between thought and action creates uncomfortable feelings of ... ‘cognitive dissonance’” (Vesilind & Gunn, 1998a: 79).

This does not mean, as has been previously stated, that ethical theorising is of little or no value. (See §2.1.2.) Indeed, in some instances, different theories might sanction the same course of action. Vesilind & Gunn (1998a: 74) show, for example, that the penalties applied to environmental misdeeds may be justified in terms of *retribution* (deontological theory) or *deterrence* (utilitarian approach). Such instances of congruence could, of course, considerably ease the development of appropriate environmental policies and codes. But, even where ethical perspectives clash, typically such as in the case of the environmental dilemma, the issues, and the options for their possible resolution, might be better understood if the theoretical underpinnings are made explicit. Thus, while no solutions are guaranteed, ethical theorising could certainly promote greater understanding of contrasting points of view, and as a result lead to more sensitivity and tolerance between those who hold different points of view.

Partridge suggests that some of this ethical dissonance may be due, in part, to a failure to appreciate that ethical theorising can be conducted on three levels. *Descriptive ethics* is an account of the moral rules and structures found in a society or community. *Normative ethics* deals with issues of “right and wrong, duties and rights, justice and injustice, virtue and wickedness”, and will have a prescriptive flavour. *Meta-ethics* is a study of the meaning of ethical terms and the justification for ethical judgements. Debates across these levels may set up spurious conflicts. For example, the meta-ethical affirmation of the rights of future generations, does not necessarily mean that they are normatively entitled to experience, say, a natural amenity (such as the Baakens River valley)<sup>76</sup> in a pristine state (Partridge, 2004: 7-8).

Nevertheless one must still deal with the lack of consensus between moral theories. Where such differences are fundamental and there appears to be no possibility of justifying the validity of one belief system over another, then one is inevitably looking at a scenario of moral relativity.<sup>77</sup> (See §2.1.2.) In view of such an impasse one needs to note that moral debate is not the same as scientific debate, where, as more data becomes available, one may be able to prove one theory to be more correct than another.<sup>78</sup> In moral debates “the differences are not about what is, but about what ought to be” and in this arena it is conceivable “that there can be two or more moral claims without one of them being false or invalid” (Rossouw, 2002: 68). The important challenge then, is to dig deeper and ask critically what the differences mean, and what the implications of alternative courses of action could be. Instead of either bluntly trying to establish “who is right and who is wrong”, or otherwise simply succumbing, ‘hands in the air’, to the non-directionality of undiluted relativity, one could rather pursue the route of *pluralism*, which, while recognizing differing perspectives, does not deny the value of moral debate in clarifying ethical questions, and the need for a continual striving towards moral rectitude. The moral pragmatist thus recognises the reality of competing moral prescriptions, but does not use that reality as the reason for denying the possibility that one alternative could be shown to be morally more acceptable than the other.

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<sup>76</sup> See §1.1.

<sup>77</sup> The argument here is that two opposing courses of action, each sanctioned by a different ethical perspective, cannot both be right, or more fundamentally, the underlying ethical perspectives cannot both simultaneously be valid, unless of course, one concedes to the doctrine of ethical relativism.

<sup>78</sup> This is not to deny that moral notions can evolve.

Thus, despite the lack of a clear direction in the arena of ethical theory, the use of theoretical ethical debate to further explore and clarify ideas and concepts, and to justify practice, remains valid. However to maintain some progress in the search for ethical solutions it does predicate less dogma, and more pragmatism.<sup>79</sup>

## 2.3 CONCLUSION

Having now completed an overview of the main traditional ethical theories, and even despite not having being able to identify *the* master ethical narrative, we have developed, at the very least, a feel for the “common language for discussing and understanding ethical issues” (Des Jardins, 1997: 18). With this armoury in place we can now move on, in the next chapter, to a more articulate discussion of one of the newer branches of philosophical ethics, that of environmental ethics. This narrowing of focus draws one closer to a more specific consideration, from an ethical perspective, of the environmental dilemma as outlined in Chapter 1.

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<sup>79</sup> The choice of the word *pragmatism* here foreshadows the discussions still to follow in §3.2.2.

## CHAPTER 3

### ENVIRONMENTAL ETHICAL THINKING

How narrow we selfish, conceited creatures are in our sympathies! How blind to the rights of all the rest of creation!

(John Muir, 1987)<sup>80</sup>

Although in the preceding chapter the discussions revolved, in the main, around the traditional theories in the field of philosophical ethics, where the issues of concern were largely the proper relationships between human beings, the environmental angle was considered from time to time. However in recent times, as environmental issues have become more critical, and therefore more prominent in the public mind, there has been pressure to extend the range of ethical thinking to include also the relationships between humans and nature. As a result, the field of environmental ethics has now emerged as a formal sub-discipline within the general field of philosophical ethics. This chapter will delve into the issues of environmental ethics, particularly as they relate to the so-called environmental dilemma, the addressing of which is a central theme of this study.

While it may be true to say that environmental ethics is primarily concerned with the natural environment, it must be emphasised that the focus, in the final instance, cannot fall solely on the human/nature interface. That the many and varied interrelationships between humankind and their natural environment are not independent of social issues, is reflected in the following quotation from Harvey:

Enlightenment, reason, speciesism, modernity and modernization, scientific/ technical rationality, materialism (in both the narrow and broader sense), technological change (progress), multinationals (particularly oil), the World Bank, patriarchy, capitalism, the free market, private property, consumerism (usually of the supposedly mindless sort), state power, imperialism, state socialism, meddling and bumbling bureaucrats, military industrial complexes, human ignorance, indifference, arrogance, myopia and stupidity, and the like all jostle (singly or in some particular combination) for the position of arch-enemy of environmental ethics and justice. (1999: 111-112)

Thus, although in this chapter the natural environment will feature strongly, it is the broader conceptualisation of the environment, as elaborated on in Chapter 1, that must always be in the

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<sup>80</sup> John Muir, the celebrated naturalist, as quoted by Nash (1989: 3).

background.

### **3.1 ENVIRONMENTAL ETHICS**

It is around forty years now since modern philosophers have been pointedly theorising in environmental ethics, and in the process they have uncovered a number of underlying obstacles, five of which are highlighted by Stone (2003: 194). The first of these relates to the question of human bias in addressing ethical issues related to the natural environment, and it has resulted in what has become known as the anthropocentric/non-anthropocentric debate. Secondly, and closely related to this debate, is the question of whether nature should also carry intrinsic value as opposed to having only instrumental value. To allow for more of nature to enjoy intrinsic value, some theorists have tried to extend the circle of moral considerability beyond the usual bound that allows only for the inclusion of human beings, but in so doing they have encountered the third obstacle, namely that of where then to place the periphery of moral considerability. Of particular relevance to the engineering perspective is the fourth obstacle, that of deciding how to translate environmental concerns (e.g. such as for a pristine valley) into practice. The last obstacle identified by Stone, is the question on how to adjudicate between competing moral claims (e.g. as may arise between conservation and development, a conflict, characterised in this study, as the environmental dilemma). This chapter will delve deeper into these environmental ethical problems, but it might be useful to first present an overview of the historical development of this relatively new field of study.

#### **3.1.1 Historical development of the field of environmental ethics**

The birth of the modern environmental movement is tied by some to the publication of the book, *Silent Spring* by Rachel Carson in 1962 (Cunningham & Saigo, 1999: 7; Palmer, 2003: 15). This seminal work was followed by further landmark articles and publications, amongst which were: *The Historical Roots of our Ecologic Crisis* by Lynn White in 1967, *The Tragedy of the Commons* by Garrett Hardin in 1968, *The Population Bomb* by Paul Erlich also in 1968, *The Limits to Growth* by Donella Meadows and others in 1972, and *Small is Beautiful* by Fritz Schumacher in 1973. In all of these publications a major theme is the growing impact of human activities on the natural environment, and hence a growing concern for the integrity of the

environment. This concern resulted in the convening of a number of ground-breaking conferences and commissions, notably the *United Nations Conference on Human Development* in Stockholm in 1972, the *World Commission on the Environment and Development (WCED)* in 1983, whose findings were reported in *Our Common Future*<sup>81</sup> in 1987, the *United Nations Conference on the Environment and Development (UNCED)* in Rio de Janeiro in 1992, and the *World Summit on Sustainable Development (WSSD)* in Johannesburg in 2002 (Brennan & Lo, 2002; Dresner, 2007).

From around the early seventies, in the field of philosophy, paralleling the above-mentioned developments, the sub-discipline of *environmental philosophy* or *environmental ethics* developed from obscurity to an established branch of applied ethics. This came about mainly through the work of such ethicists as Richard Routley (later Sylvan), Arne Naess, Robin Attfield, Holmes Rolston III, Paul Taylor, Baird Callicott, Bryan Norton, and others. These theorists were, as Callicott put it, “looking for a moral theory that would ethically enfranchise nonhuman natural entities and nature as a whole” – not merely (in Regan’s words), “an ethic for the *use* of the environment, ... but an ethic *of* the environment” (Callicott, 2003: 203). The motivation for this development, on a more practical level, lay in the need “to establish a rational basis on which [one] could distinguish environmentally sound from environmentally unsound forms of production and consumption, lifestyles, courses of action and policies” (Hattingh, 1999: 60). As these objectives clearly overlap the environment/development conflict – the environmental dilemma – outlined in Chapter 1, an investigation into the evolution and the “essence” of the field of environmental ethics is obviously very relevant to this study.

The historical development of this sub-discipline, over the last forty years or so, has been characterised by:

- its establishment as a recognised academic field
- the tension existing between the theoretical thrust and the practical thrust within the discipline, with the former dominating
- the increasing diversification of positions within the field, as against the convergence deemed desirable (Hattingh, 1999: 70-1).

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<sup>81</sup> This report is also commonly known as the Brundtland Report, after the chairperson of the Commission, Gro Harlem Brundtland.

It might be argued that the latter two points above militate against the stated reasons for the development of the discipline of environmental ethics, but Hattingh argues that as this discipline is still in its originary and exploratory stages, it is too early to expect definitive answers from it, and that it should rather be viewed as a large toolkit from which various tools may be drawn, as and when they are needed (1999: 80).

The diversity that has developed in the field of environmental ethics can be illustrated by the number of bilateral debates which occur in this field, some of which have already been alluded to.<sup>82</sup> Three of these debates, which will be discussed in greater depth in the following sub-sections, are:

- instrumental versus intrinsic values
- anthropocentrism versus non-anthropocentrism
- monism versus pluralism.

### **3.1.2 Instrumental versus intrinsic values**

As has been intimated above one of the main functions of environmental ethics is to determine the proper relationships between mankind and nature. To a large extent this depends on the type of value that is accorded to nature. Broadly speaking values can be accorded on an instrumental basis or an intrinsic basis.

*Instrumental value* is a function of usefulness. ... The instrumental value of an object lies not in the object itself but in the uses to which the object can be put. When such an object no longer has use, or when it can be replaced by something of more effective or greater use, it has lost its value and can be ignored or discarded. (Des Jardins, 1997: 128)

It can be argued that often engineers will mostly view nature on an instrumental basis. For example a river is seen more as a source of water (to be utilised for human benefit), rather than as an object of beauty, or a source of religious or cultural value. Values based on beauty, or on religious or cultural significance would be closer to the category of intrinsic value.

An object has *intrinsic value* ... when it is valuable in itself and is not simply valued for its uses. ... Some things we value because we recognise in them a moral, spiritual,

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<sup>82</sup> Harvey mentioned several other “axes of difference”: individualistic vs. communitarian views, culturally based vs. universal views, materialist vs. spiritual concerns, and hubristic vs. humble attitudes. (1999: 110-111)

symbolic, aesthetic or cultural importance. We value them for themselves, for what they mean, for what they stand for, for what they are, not for how they are used. (Des Jardins, 1997: 129)

Two leading figures (already mentioned in Chapter 1) that were active in the early environmental movement in the USA, became, for some environmentalists, the standard bearers of these contrasting views on values. Gifford Pinchot, head of the U.S. Forest Service, “emphasized the instrumental value of forests and wilderness areas ... [because they are] the home of vast resources that humans can use” (Des Jardins, 1997: 128). In contrast John Muir, founder of the Sierra Club, saw “the great sequoia groves as a cathedral, suggesting that they possess a spiritual and religious value far above their economic usefulness” (Des Jardins, 1977: 129).

Some may contest the assertion that values such as cultural or spiritual values are intrinsic. They argue that as these values are *humanly* defined and are aimed at meeting *human* cultural and spiritual needs, they are in effect instrumental values. Thus the distinction between instrumental and intrinsic values is not always crystal clear, and so one may distinguish even further subsidiary positions within each of these two categories of values. Instrumental values may, for example, be interpreted from either a position of *strong* or *weak anthropocentrism*. (Anthropocentrism will be discussed more fully in §3.1.3, but in short it can be taken as the propensity to view and value nature through human eyes, that is, to see nature basically in terms of the benefit it has for humans, and to interpret its functioning as an extension of human functioning.) Strong anthropocentrism focusses in the main on nature as a resource base for humans, and it is from this perspective that William Baxter can say,

I reject the proposition that we *ought* to respect the “balance of nature” or to “preserve the environment” unless the reason for doing so, express or implied, is the benefit of man. (1995: 382)

While many environmental ethicists will disagree with this strong anthropocentric stance, not all of them will necessarily conclude that the solution lies in ascribing intrinsic value to nature. Instead, to avoid the philosophical problems around the definition of intrinsic values, they will accept that nature has instrumental value, but argue for a “perfectly sufficient environmental ethic; which can criticize value systems purely exploitative of nature, [and which] can be justified on (weakly) anthropocentric grounds alone” (Palmer, 2003: 18). Along these lines

Norton (1995: 183), suggests that we establish values on the basis of *felt* and *considered* preferences. A felt preference includes “any desire or need of an human individual that can, at least temporarily, be sated by some specifiable experience of that individual”, and as such is “insulated from any criticism”. It seems likely that felt preferences could comfortably be aligned with a consumptive, or strongly instrumental, view of nature. A considered preference, on the other hand, is “any desire or need that an individual would express after careful deliberation, including a judgement that the desire or need is consistent with a rationally adopted world view”, and which, as such, can be debated and criticised. While instrumental values based on felt preferences may be reflective of strong anthropocentrism, those based on considered preferences can be associated with weak anthropocentrism. Norton’s approach will allow, at the first level, for individual felt preferences to be satisfied by, for example, a fair distribution of natural resources amongst individuals now living. However, in addition to this immediate, short term view, there are also longer term considerations. Based on a rational world-view that includes the aim of inter-generational justice, a considered preference will require that we manage our present resource use in a conservative manner so as not to disadvantage future generations. Thus the exploitative, “strong” anthropocentric tendency of the first level of value, is tempered and modified by the conservative, “weak” anthropocentric approach on the second level of value. And on this basis Norton claims that one can develop an adequate environmental ethic without resorting to the assignment of intrinsic value to nature.

Those that ascribe intrinsic value to nature would, in general, also be well disposed towards a non-anthropocentric orientation, but in addition they could also be regarded as being either *objectivists* or *subjectivists*. Norton’s notion of weak anthropocentrism may find some congruence with the view of the intrinsic value subjectivists. They claim that while nature may have intrinsic value, it is impossible for this to be objective value. Values are human products; values lie in the eye of the beholder and not in the object. And so “[a]ccording to Callicott’s view, the intrinsic value of nature is not inherent in nature, but ascribed subjectively to nature by human beings” (Hattingh, 1999: 69).

The *objectivists*, on the other hand, have a different view of the intrinsic value of nature. Palmer, paraphrasing Rolston, claims that “it pre-exists human beings ... and would continue even if humans were to become extinct” (2003: 17). This idea put forward by Rolston harks

back to the notion of moral realism which “is simply the metaphysical (or ontological) view that ... moral facts [exist]” and that “by moralizing we can discover what these objective moral facts determined by circumstances are” (Smith, 1995: 402 & 400). Thus Rolston not only sees intrinsic value as residing objectively in nature, but also that this value inheres from the level of individual organisms, through the level of species, to the level of ecosystems (1998: 71-86).<sup>83</sup>

This two-fold understanding of intrinsic value (objectivism and subjectivism) is paralleled by the two forms of intrinsic value suggested by Sagoff, namely *aesthetic* and *moral* value (1995: 173). He maintains that in both instances the qualities that invoke these values reside in the object to be valued. However the qualities that lead to aesthetic value can change, and do in some degree depend on the observer. For example, I may value the beauty of a natural, desert landscape, but if I am lost in that desert and am without any water, it loses that value, and instead appears harsh and unforgiving. Moral value on the other hand is more constant, and can to some degree be compared to love or altruism – a mother loves her child irrespective of the circumstances.

Engineers, operating mostly out of a utilitarian framework in their encounter with the environment, will as has already been stated, generally be comfortable with instrumental values, particularly if these are translated into economic terms. Intrinsic values on the other hand, whether of the objective or subjective kind, they will find more difficult to incorporate into their calculus. However, as has been indicated above, it is not only engineers that have a problem with intrinsic values. Some environmentalists claim that the philosophical difficulties around the concept of intrinsic value may in fact, unnecessarily, detract from the primary objective of formulating an environmental ethic, which they claim can be done quite adequately without resorting to the notion of intrinsic value. While it has been argued that to understand instrumental values, one needs some grasp of the notion of intrinsic value, Weston shows that the traditional requirements of intrinsic value, viz., self-sufficiency, abstractness, and grounding raise problems in their own right, and that instead of strengthening the argument for an environmental ethic they may in fact weaken it (Weston, 2003: 307-318). As an example of the

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<sup>83</sup> This spectrum of the loci of intrinsic value suggested, by Rolston, brings forward another dualism evident in environmental ethics, namely that of *individualist* vs. *holistic* approaches. For example Regan and Taylor, who locate value in individual organisms, can be regarded individualists, whereas Rolston and Callicott, who see value in systems beyond the level of individuals, would be regarded as holists (Palmer, 2003: 19-25).

philosophical quandaries one can get caught in when attempting to pin down the intrinsic value concept, consider the idea that a value is instrumental because it serves another value, which in its turn is also instrumental as it may serve yet another value, and so forth. So, I may value a field of wheat, as from it I can derive bread, which in turn I value because from bread I gain sustenance, which in its turn contributes to my health, which I value because it makes me feel well. However, it is argued, this chain of values must eventually stop in a self-sufficient, fairly abstract, intrinsic value. Weston claims that many environmentalists expend far too much effort in trying to determine this final end, in order to substantiate intrinsic value, while in fact this linear value model presented here is in itself rather inadequate. Instead Weston favours “a more holistic ... conception according to which values are connected in a weblike way, so that any value can be justified by referring to those ‘adjacent’ to it” (2003: 311). And so it appears that this integrated, weblike conception of values may render the instrumental/intrinsic value debate somewhat less pressing. By building this non-linear understanding of the nature of values out into a more comprehensive environmental ethic,<sup>84</sup> it may be argued that the instrumental/intrinsic value distinction is not necessarily fundamental (Light, 1996: 325-326).

On the other hand it may also be argued that the notion of intrinsic value can, despite its difficulties, still be usefully employed in environmental ethics. Ethicists who maintain this position include McShane, who applies a pluralistic understanding to intrinsic value which recognises that while some conceptions of intrinsic value are problematic (e.g. the idea that intrinsic value represents absolute value), there are other kinds of intrinsic value, which if ignored, environmental ethics would be all the poorer for. Such forms of intrinsic value are, for example, manifested in the love, respect or awe one might experience towards a person or an object (McShane, 2007: 52-56). Hattingh too argues for a

... a less extreme interpretation of intrinsic value ..., that still opposes the reduction of nature and life to a commodity, and rather sees the intrinsic value of the earth system and of life as point of departure for a caring and careful interaction with the earth system and the life it supports, in which its richness and diversity are embraced as valuable in itself – and is protected, cared for, nourished and celebrated for nothing else than it being the wonder it is. (2014: 242)

The issue of intrinsic value will be further expanded on in §4.2.4.

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<sup>84</sup> This approach, known as environmental pragmatism, is dealt with more fully in §3.2.2.

### 3.1.3 Anthropocentrism versus non-anthropocentrism

As has been suggested in the previous sub-section, the anthropocentric/non-anthropocentric debate quite closely overlaps the instrumental value/intrinsic value debate, with anthropocentrists tending to accord instrumental value to nature, while non-anthropocentrists lean towards the ascription of intrinsic value to nature. While some theorists may claim that the anthropocentric/instrumental value position is by virtue of its very nature an inadequate environmental position,<sup>85</sup> there nevertheless are many environmental ethicists who admit to an anthropocentric orientation, but who would, while acknowledging the prodigal human footprint on nature, still maintain that these environmental problems can adequately be addressed through a human-centred approach.<sup>86</sup> Indeed much of national and international environmental policy is based on anthropocentric approaches (Palmer, 2003: 18). For example, the Bill of Rights in the SA Constitution calls for the protection of the environment, not for its own sake, but because a healthy environment is a *human* right. (South Africa, 1996: S. 24)

The anthropocentric/non-anthropocentric divide can also be characterised by a number of distinctive positions that span across this divide – Hattingh suggests no less than six (1999: 71-78). The first three of these can be described as anthropocentric, and they range, in Norton’s nomenclature, from strong to weak anthropocentrism (1995: 183-185).

The first, and most extreme, of these anthropocentric positions is that of the *ruthless developer*, which could hardly be considered an environmental ethical position at all, as it emphasises short-term advantage and relentless development, irrespective of the cost to the environment. Any value it may place on the environment is entirely instrumental. This position is characterised by:

- physical transformation of the natural world, “for example, by farming, damming, pulping, and slaughtering”,

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<sup>85</sup> Fox considers anthropocentrism to be “empirically bankrupt and theoretically disastrous, practically disastrous, logically inconsistent, morally objectionable, and incongruent with a genuinely open approach to experience” (1995: 18-19) and Katz maintains that it “cannot be the basis of a real environmental ethic” (1996: 311).

<sup>86</sup> Some would wonder, given the very humanness of our being, if it could ever be possible to have a perspective that is, in the last instance, not anthropocentric.

- the interpretation of progress in terms of economic growth,
- the belief in unlimited resources,
- short term thinking, and
- belief in the ability of technology to provide the answers (Hattingh, 1999: 71-72).

In the context of this research these characteristics need to be noted with some concern. To a larger or lesser degree, they might all underlie much of contemporary engineering practice.

The second position, that of *resource conservation*, holds a more moderate anthropocentric stance. While the emphasis here still remains on the usefulness of nature for human beings, and the benefits that can accrue to humans from the physical transformation of nature, there is at least a recognition that there are limits to material growth, and to this extent the resource conservationists hold a more long term view. Nevertheless natural resources are there to be used; and not doing so at some time would be wasteful. Concepts such as “cost-benefit analysis” and “maximum sustainable yield”<sup>87</sup> are part of the arsenal of the resource conservationist. (See Hattingh, 1999: 72.) The practice and world-view of Gifford Pinchot, the previously mentioned US forester, would fit comfortably within this paradigm.

John Muir, Gifford’s adversary, on the other hand, leans more towards a stance of *wilderness preservation*, the next (and weakest) of the anthropocentric positions. Although the focus of this position is that certain areas of nature should be preserved untouched by humans, the purpose of such preservation is still for the ultimate benefit of mankind. For example, it may be argued that there may still be undiscovered medical cures to be found in nature, or that pristine nature may be a source of aesthetic pleasure or spiritual inspiration for humans. In this manner, a number of similarly human-centred reasons may be put forward for wilderness preservation – Glavovic (undated: 3-4) puts forward no less than twelve such reasons.

To reiterate, while much of public environmental policy is couched in anthropocentric terms, and while some ethicists may argue that anthropocentrism, in its weak form, can provide for adequate protection of the environment, many would gainsay this claim. Indeed, according to

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<sup>87</sup> Again these terms are often part of the engineering vocabulary.

Palmer,

much work in environmental ethics has been to contest an anthropocentric, instrumental valuation of the nonhuman natural world, and to argue that new ways of thinking about and valuing it are needed. (2003: 18-19)

Obviously then the “new ways” being mooted must tend towards a non-anthropocentric orientation, where nature is valued in its own right, and not for any value that it may have for humans. Furthermore, the non-anthropocentrist would charge that we, as the human species, deliberately or sub-consciously, exhibit a human bias in our dealings with the non-human world, and that as a consequence our actions will tend to favour human beings to the detriment of the natural environment. This leads to the idea of “speciesism” which is “the belief that we are entitled to treat members of other species in a way in which it would be wrong to treat members of our own species” (Singer, 1995: 54). Given these considerations, non-anthropocentrists would argue that this situation can only be rectified by a significant, and maybe even radical, shift in our traditional, human-biased, world-view. The remaining three positions or groupings on the anthropocentric/non-anthropocentric spectrum, as identified by Hattingh (1999: 74-78), are designated as *ethical extensionism*, *ecological sensibility*, and *radical environmental ethics*, and they all attempt, each in their own way, to achieve this fundamental paradigm shift.

The position characterised as *ethical extensionism* argues that the boundaries of ethical considerability need to be extended. For reasons such as the assertion that only humans are capable of moralising, human beings have traditionally been considered as the only beings worthy of moral consideration. The extensionists see this traditional stance as being unjustifiably biased, and therefore would argue that the circle of moral consideration needs to be expanded beyond the range of human beings to include, at least, some categories of animals. In this vein Singer, for example, argues that all animals capable of sentience should be included in the sphere of moral considerability (1998: 360-361). The criterion that Regan uses is that of being the “subject of a life ... [i.e.] a conscious creature having an individual welfare that has importance [to the creature itself]” (1995: 77). Both the criteria of Singer and Regan are not absolute, and may be interpreted variously in practice. Thus it seems that the extensionist position, notwithstanding any merit that it may otherwise have, is inherently weakened by the difficulty one has in determining, and justifying, precisely where the bound of moral

considerability lies.

Singer in defending the criterion of sentience, says (quoting Bentham), “The question is not, Can they *reason*? nor Can they *talk*? but, Can they *suffer*?” (1995: 52) Thus, according to Singer, all sentient animals (mainly mammals) who quite evidently can experience pain, are morally considerable.<sup>88, 89</sup> Singer’s extensionism has a utilitarian underpinning in as much as he wants to maximise pleasure or minimise suffering (Palmer, 2003: 19). Problematically for some, this utilitarian angle would still permit, for example, the killing of an individual within the ranks of the morally considerable, provided that it is done painlessly, and that the majority benefit (Palmer, 2003: 21).

To avoid the utilitarian flavoured extensionism, as described above, some theorists turn to more deontologically aligned approaches. To them the value ascribed to an organism does not reside in its state (of pleasure or pain), but rather in the organism itself. Thus, for example, Regan contends that an organism, if it has *inter alia* “beliefs and desires, perception, memory, and a sense of the future”, that is, if it is the “subject-of-a-life”, becomes the locus of value, and this criterion forms the basis of his animal rights approach (1998: 351). However even if this criterion could be interpreted accurately, for some it is still too restrictive, and ethicists such as Schweitzer and Taylor contend that the criterion should be *life* itself (Palmer, 2003: 22-23). Taylor, in promoting this *biocentric* outlook, argues “that all organisms are teleological centres of life, ... [with] each ... pursuing its own good in its own way”, and that as a consequence “human beings are not inherently superior to other living things” (1998: 366-367).

Clearly a major difficulty of the extensionist approach is then the challenge in trying to find a criterion that is not only widely acceptable, but also precise in determining who qualifies for inclusion into the status of being morally considerable. Allied to this problem is the human subjectivity involved in selecting such criteria. While ethical extensionism represents a move away from the anthropocentric positions previously discussed, the human bias in selecting

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<sup>88</sup> Following on from his premise of sentience Singer concludes that animal experimentation is ethically unacceptable and that we are morally obliged to become vegetarians (1995: 55-58).

<sup>89</sup> It still seems unclear if animals such as birds, fish and insects are sentient, and if so, to what degree. And following on from that one may then well want to ask what degree of sentience qualifies for moral inclusion?

criteria for inclusion suggests that more than a hint of anthropocentrism still lingers. Another problem that adheres to the extensionist approach is the focus on *individual* organisms, irrespective of whether it be their sentience, sense of self, or life that qualifies them as being morally considerable, and as a result this approach may miss the value that resides in ecological wholes such as in species or in ecosystems.

Even after the criterion of moral inclusivity has been settled, the extensionist approach still has the difficulty of judging between competing ethical claims arising from those within the extended circle of moral considerability. For example, in the case of the Brenton Blue butterfly (mentioned previously in §2.1.2), where the extinction of this butterfly species was threatened by a township development, the question of whose rights should prevail, those of the developer or those of the butterflies, still remains moot, notwithstanding an *a priori* acceptance that the interests of both the developer and the butterflies, as living beings, are taken to be worthy of moral consideration. To overcome these problems some form of hierarchy may be instituted. For example, Lombardi brings into consideration additional attributes such as vegetative, sentient and reflective capacities (Palmer, 2003: 23). However these hierarchies are again debatable in terms of content and priority, and in the end again humanly defined, therefore still facing the charge of anthropocentrism.

The fourth position, identified by Hattingh (1999: 75), on the anthropocentric/non-anthropocentric spectrum, the *ecological sensibility* grouping, overlaps somewhat with the previous position, as it includes all who have a broadly inclusive view, such as the biocentric view of Taylor. But in addition, it also covers those who extend the claim of moral worthiness beyond the level of *individual* organisms so as to also include collectives. They would argue that a view which is focussed on individual organisms only, is too narrow, and that as a result, much of nature, which also merits moral consideration, is left out of contention (Palmer, 2003: 23; Hattingh, 1999: 76). So, for example, Rolston states, “it is not mere individuality that counts; the species is also significant because it is a dynamic life-form maintained over time” (1998: 78), and he then goes further to include eco-systems as well (1998: 81-83). This latter approach echoes Aldo Leopold’s so-called *land ethic* which requires us to think “like a mountain” (1970: 137), an injunction that implies consideration for both the living and non-living components of a mountain. This land ethic of Leopold is pithily summed up in his well-

known dictum:

A thing is right when it tends to preserve the integrity, stability and beauty of the biotic community. It is wrong when it tends otherwise. (1970: 262)

James Lovelock (1991) proposed that even the earth may be seen as an organismic whole, and based on this perception some ethicists predicate an *ecospherical ethics*. Palmer (2003: 23-25) refers to these latter approaches as holistic and suggests that, because they generally are of a utilitarian nature (note the consequentialism evident in the quote from Leopold above), their common shortcomings may be as listed previously for utilitarian approaches. For example, there is, in the words of Regan, “the clear prospect that the individual may be sacrificed for the greater biotic good, in the name of ‘the integrity, stability, and beauty of the biotic community’” (1998: 358). While deontologically oriented theorists may regard this type of action to be ethically unacceptable, it is not uncommon in environmental practice (e.g. such as in the case of the culling of animals in order to preserve ecosystem health).

In the final position on the anthropocentric/non-anthropocentric spectrum Hattingh identifies a rather disparate grouping, gathered under the heading of *radical environmental ethics*, which consists of a number of distinct positions, not overtly related (1999: 77-78), other than that they share a quest for a very fundamental transformation of the traditional premises that inform modern day society. They propose radical new world-views to replace our traditional ones; world-views which respectively challenge our traditional approach to self-realisation, our traditional sense of gender, and the traditional power relationships prevalent in our society.

*Deep ecology* is one such position under the radical environmental ethics label, and it is characterised metaphysically as holistic, ethically as based on biocentric equality, and politically as favouring diversity and decentralisation (Palmer, 2003: 30). Claiming to be thoroughly non-anthropocentric it may be contrasted against a more anthropocentrically oriented shallow ecology, which, for example, in regard to natural resources, places “emphasis ... upon resources for humans, especially for the present generation”, whereas the deep ecology approach emphasises “resources and habitats for all life forms for their own sakes ... [with] a long-range maximal perspective of time and place” (Fox, 1996: 37; Naess, 1998: 441). Deep ecology further distinguishes itself from shallow ecology by formulating ever deepening questions about our ecological relationships until our most fundamental, or ultimate premises

are revealed (Fox, 1995: 92). While Arne Naess, the founder of the deep ecology movement, recognises that there may be several different orientations in these ultimate premises (such as Christianity, Buddhism, etc.), he, himself, prefers a philosophical orientation which he calls “Ecosophy T”. The main injunction arising from this philosophical orientation is, according to Naess, “Self-realization!”, which “implies maximizing the manifestations of all life” (1998: 445). This means that human beings can only realise their true potential through recognising the value inherent in the rest of biological nature. Related to this tenet, and equally fundamental, is the other main tenet of deep ecology, holism, “the claim that everything is fundamentally one” (Palmer, 2003: 30). On these foundations Naess (and Sessions) build a platform of eight basic principles which flow from the ultimate premises, and which provide a more practical interpretation of deep ecology thinking (1998: 438-439). They range from according intrinsic value to all forms of life, to the requirement that human lifestyles and policies need to change to be in line with a fundamental concern and respect for nature. The “essence” of these principles, Naess believes, could be derived, equally well, from a different orientation in the ultimate premises. Detractors of the deep ecology philosophy point to the practical difficulties around biocentric *equality* (as mentioned previously), and they would also argue that the emphasis in deep ecology on an all-inclusive self-realisation allows no room for the idea of “otherness” that is important, for example, to ecofeminists (Palmer, 2003: 31). Otherness also allows space for the recognition that humans, as opposed to other beings, have special duties with regard to the environment.

The positions of *ecofeminism* and *social ecology* target the historical and prevailing patterns of dominance in society, which they respectively identify as the wide-spread occurrence of patriarchal relationships, and the power politics of liberal capitalism. Ecofeminists and social ecologists reject these patterns of dominance and then, by extension, also the domination of mankind over nature. If this stance qualifies them nominally as non-anthropocentric, this angle is not always fully developed. For example, Hattingh claims that in some cases the feminist approach has led to “a disappointing inversion of patriarchy, ... in which women are seen as occupying a privileged position vis-à-vis nature” (1999: 77). But on the positive side ecofeminism has also “led to radical re-conceptualisations of male-female, human-nature and human-machine relationships” (Hattingh, 1999: 77). The goal of an overarching, universal ethical theory is criticised by ecofeminists for its emotionless rationality and its pseudo value-

neutrality, and instead they would prefer a more contextual approach with greater emphasis on relationships, in particular the relationship of *care* (Palmer, 2003: 31). This ecofeminist approach thus does open itself up, to some degree, to a charge of moral relativity, but the response to this charge is to create “‘boundary conditions’ [which] exclude oppressive and patriarchal frameworks” (Palmer, 2003: 32).

Murray Bookchin, the main proponent of social ecology, sees (as do many others) the present pervasive quest for economic growth and expanding markets, and the associated technological processes and consumption of natural resources, as propelling society towards a destination of environmental destruction (Light, 1996a: 162-164). The liberal environmentalists, aligned as they are to the free-market system, lack the foundational convictions needed for radical societal transformation, and therefore can only effect superficial improvements to the modern, environment-degrading patterns. In reaction, Bookchin proposes the social ecology approach which aims specifically at radical social transformation. It requires that society be transformed into “small-scale, self-sufficient, self-governing communities with fully participatory democratic structures and institutions ... [because only then will] humans ... be able to live in harmony with nature and ecological systems” (Hattingh, 1999: 78).

The *bioregionalism* position calls for a similar reconstruction of society. It rejects “capitalism, destructive technology, industrialisation, international trade and consumerism” and requires that through “communalism, appropriate scale, participatory decision-making, and subsistence living, including recycling and permaculture” we relearn “how to live in a place in a manner that is sustainable over time” (Hattingh, 1999: 78). In order to achieve these goals society will need to be reconstructed into bioregions, defined by Sale as follows:

A bioregion is a part of the earth’s surface whose boundaries are determined by natural rather than human dictates, distinguishable from other areas by attributes of flora, fauna, water, climate, soils and landforms, and the human settlements and cultures those attributes have given rise to. (1991: 78)

Sale further characterises a bioregion as one where the economy

derives its character from the conditions, the laws, of nature. ... [It] would seem to maintain rather than exploit the natural world, accommodate to the environment rather than resist it; it would attempt to create conditions for ... a ‘steady state’, rather than for perpetual change and continual growth in service to ‘progress’... (1991: 79)

In such a region even the political principles are

on a bioregional scale ... [and] grounded in the dictates presented by nature, ... [They are] those of scale, decentralization, division and diversity. (Sale, 1991: 80)

All of the radical environmental approaches may be characterised as unrealistically utopian in that they propose a radically new type of society without being very clear on how these radical societal conversions are to be achieved in non-autocratic societies. The record does not seem to indicate that democratic, Western societies would easily and voluntarily accept such radical changes to their lifestyles, particularly if these entailed marked curtailments of present consumption patterns. Of course if these societies were to adopt the new radical world-views, the required lifestyle changes might flow more naturally, but it is no easy matter to change deep-seated world-views. Also problematical from an engineering point of view, is that with present day engineering practice being embedded, by and large, in the Western paradigm of technology and economic growth, it will, in the eyes of many radical environmental ethicists, be cast inevitably in the role of environmental malefactor. Part of the objectives of this study is to see how engineering practice can be directed or changed so that such accusations can be adequately refuted.

The six-fold characterisation of environmental ethics by Hattingh is manifestly not the only way in which this field of study may be broken down. Carolyn Merchant presents an alternative “threefold taxonomy”, which decomposes the field of environmental ethics more broadly into the three approaches of *egocentrism*, *homocentrism* and *ecocentrism* (1990: 45-68). These positions range, as can be expected, through the whole anthropocentric/non-anthropocentric spectrum. Egocentrism can roughly be aligned with strong anthropocentrism, homocentrism with weak anthropocentrism, and ecocentrism with non-anthropocentrism. Although the resolution of Merchant’s breakdown is considerably more coarse than that of Hattingh, she introduces another line of approach by explicitly connecting typical socio-political arrangements and historical precedents to each of the three positions she identified. Based on this line of thinking it may be contended that the environmental problems we face are rooted in the prevailing socio-political system. So, for example, Marx argues that the “wanton destruction of the natural environment which can accompany modern technology, result[s] primarily from its misuse by capitalism in its drive for higher profits” (Zimmerman, 1979: 99). On the other hand Heidegger (Zimmerman, 1979: 100) and Porritt (1991: 35) argue that it is

the modern scientific industrial system (whether Marxist or capitalist) that is the main cause of environmental undoing.

Returning to Merchant's analysis, we find that she aligns an egocentric ethic with capitalist societies, while the homocentric ethic, she maintains, is more compatible with socialist approaches (1990: 52). Ecocentrism, with its elevation of the whole over the constituent parts, notwithstanding initial accusations of fascism, is more generally associated with "small-scale, back-to-the-land" thinking – communalism and bioregionalism (Merchant, 1990: 61). Given the dominance of capitalism and socialism in the mainstream political agendas of the world, one can see that it will be difficult for engineers to operate ecocentrically, as this approach would be contrary to the socio-political milieu in which they stand. This could explain why the examples of the application of an ecocentric ethic quoted by Merchant (1990: 62-65) do not include one based on engineering practice. Instead the given examples suggest a turning away from technocentric approaches. A tabular summary of Merchant's typology is given in Appendix A.

Newton (2003: 21-24) also opts for a three fold categorisation of the field of environmental ethics, namely *anthropocentrism*, *biocentrism* and *ecocentrism*. In her search for a viable environmental ethic she moves through each of these approaches, progressively widening the sphere of moral considerability. However in her estimation, even the most inclusive of these approaches, the ecocentric approach, still, by itself, fails to produce a viable environmental ethic, forcing her to search further for a solution, which she finally claims can be found in a virtue theory model.

While the theoretical positions that emerge from these various breakdowns of the field of environmental ethics, and the moral theorising around them, are useful from a descriptive point of view, the quest for a normative philosophy that can resolve our practical environmental problems still seems far off.<sup>90</sup> One possible conclusion that one can draw from this lack of consensus amongst the various theoretical approaches, is that they may be based on a flawed premise. This is the premise which assumes that there is a moral Truth, that it is coherent and

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<sup>90</sup> This is not to deny that the theorising, in clarifying the various positions, has helped to make the ensuing debate more intelligible.

that it is to be found in a single, all embracing, theory or principle which covers all situations. This perspective, known as monism, while quite pervasive amongst ethicists, has been critically questioned, particularly by those who feel more inclined towards pluralism. It is this debate between monism and pluralism to which attention is turned in the next sub-section.

### 3.1.4 Monism versus pluralism

Underlying many of the theoretical approaches to environmental ethics that have been considered so far, is the sense that the answer being sought, is contained in some single, powerful, overarching principle or theory. This idea of a ‘master principle’ is the “essence” of the notion of *monism*. The debating, back and forth, between the proponents of the various environmental ethical approaches, is indicative of the fact that most of the proponents have consciously or unconsciously adopted a monistic position. In Hattingh’s words,

[t]he fierce in-fighting between the different positions within environmental ethics can in part be explained by the fact that many of these positions are characterised by ethical monism: the adoption of a single principle, or a set of closely related principles on the basis of which a comprehensive ethical theory is built. (1999: 79)

The desire for a monistic solution is understandable because “it echoes one God, one grand unified theory”, and because it resembles the scientific model with its exact closure, and its intolerance of contradiction and inconsistency (Stone, 2003: 197 & 199).<sup>91</sup> And, according to Callicott, consistency “is not just a shrine before which philosophers worship”, it also has serious practical consequences:

Attempting to *act* upon inconsistent and or mutually contradictory ethical principles results in frustration of action altogether or in actions that are either incoherent or mutually canceling. (Callicott, 2003: 208)

However the mere existence of so many different approaches in the field of environmental ethics (or, for that matter, even in the broader field of philosophical ethics), suggests either that the master principle is yet to be uncovered, or alternatively, that it possibly does not even exist.

Palmer wonders

... whether it is possible, within an ethical constituency so large that it could include the entire planet, to arrive at a single governing ethical principle or set of consistent

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<sup>91</sup> For an example of the scientific model consider the law of gravity; for all practical purposes it *always* holds.

principles to apply to all ethical problems. (2003: 17)

And Stone concludes that “to unify all ethics within a single framework capable of yielding the one right answer to all our quandaries [is] simply quixotic” (2003: 196).

If the ideal of monism then remains unrealised, one may need to consider the alternative, *pluralism*, which

refuses to presume that all ethical activities ... are in all contexts ... determined by the same features ... or even that they are subject, in each case, to the same overarching principles ... [but rather] invites us to conceive the intellectual activities of which morals consist as being partitioned into several frameworks, each governed by its own appropriate principles. (Stone, 2003: 197)

Callicott (a monist himself) maintains, somewhat sophisticatedly, that it is partly the success of the various monistic theories, and the rigour with which they have been argued, that has “resulted in an embarrassment of riches, ripe for pluralist picking” (2003: 204). Be that as it may, a number of theorists have turned to pluralism to find a more defensible underpinning for environmental practice.<sup>92</sup> For example Freeden contends that “[m]any holisms can be applied to make sense of one series of facts and phenomena; hence there are also many alternative harmonies, not just one” (2003: 36).

But, this is not to say that pluralism does not have problems of its own. The most serious of these is the obvious danger of relativism. By pointing out this danger one is not suggesting that pluralism can blandly be equated to relativism; after all pluralism is the *serious* consideration of alternatives as opposed to the *immateriality* of the alternatives in relativism. But it cannot be denied that pluralism may, on occasion, give rise to conflicting proposed courses of action. However, in such cases, Stone still insists that pluralism will at least “eliminate the options that are morally unacceptable ... [and probably] the choices that remain are equally good or equally evil or equally perplexing” (2003: 210).

Callicott is not happy with this conclusion and he cautions against the possibility of “moral promiscuity”, that is, the mercenary use of the various ethical principles that make up a

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<sup>92</sup> These include Stone, Wenz and Light, all of whom participate in the monism versus pluralism debate in Light & Rolston (2003), and Norton (1994).

pluralistic approach, by unscrupulous operators in order to further their own agendas (2003: 201). In a more fundamental objection he equates pluralism to “deconstructive postmodernism” which denies the possibility of an overarching principle and is essentially nihilistic (Callicott, 2003: 206-207). While he remains open-minded in respect of the possibility of a metaphysical exposure of the “Truth”, he still maintains that it is possible to “generate comprehensive conceptual systems that fully embrace our ever-growing body of empirical knowledge, scientific theory, and self-discovery” (2003: 211). He puts forward such a theory<sup>93</sup> based on moral sentiments which evolve in communities structured in a series of ever-increasing, concentric rings (in a symbolic sense) of emotional affinity. The moral consideration of entities in these communities decreases the further they are positioned away from the centre of the concentric rings (2003: 214-216). In support of his approach Callicott concludes:

We have before us then the bare bones of a *univocal* ethical theory embedded in a coherent world view that provides, nevertheless, for a *multiplicity* of hierarchically ordered and variously “textured” moral relationships (and thus duties, responsibilities, and so on) each corresponding to and supporting our multiple, varied, and hierarchically ordered social relationships. If we accept it, we can then discard the competing and inconsistent metaphysics of morals – Kant’s, Bentham’s, and the lot – that make up the theoretical menagerie of moral pluralism and, in the last analysis, that only serve to obfuscate the actual basis of our multiple moral sensibilities, the interplay between them, and the lexical principle of their delicate arrangement. (2003: 215-216)

The fact that Callicott’s theory does not enjoy much more support than any of the other main theories, and also the fact that the problem of adjudicating between competing moral demands arising from the “univocal” structure that he proposes, still persists, means that in a practical sense, there still is no universally accepted and completely workable monistic system.<sup>94</sup> So can one avoid the conclusion that the most productive way forward is via the alternative route of pluralism?

Wenz (2003: 220-228) identifies three levels of pluralism, viz. minimal, moderate and extreme pluralism. Minimal pluralism exists when a theory lacks a “universal algorithmic decision procedure” that can be applied by “ordinary people” in practical situations (2003: 221). Wenz

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<sup>93</sup> Callicott based his theory on ideas derived from Hume, Smith, Darwin and Leopold.

<sup>94</sup> Nevertheless it will be seen later that “the bare bones of ... [Callicott’s] *univocal* ethical theory” do find some resonance with the ethical model that will be proposed in this study.

then proceeds to show that even the established monistic theories cannot in all instances provide unambiguous solutions to practical moral dilemmas, thus concluding that all known theories, monistic or otherwise, are at least minimally pluralistic.

Extreme pluralism, on the other hand, is far more specific, and for some, objectionable, as it “requires alternations among radically different metaphysical perspectives”, which not only seems very selective, but also ethically unsound. Both Wenz and Callicott reject the extreme pluralism, which they find evident in Stone’s work (Wenz, 2003: 222-223). Wenz formulates his rejection around his assertion that Stone’s pluralism implies that in a given situation one will apply a chosen ethical theory to the exclusion of all the others, and when in another situation one would change, chameleon-like, to use a completely different theory (2003: 224). (Stone might feel a little aggrieved at this charge as he does suggest, firstly, that in many cases the different theories may lead to the same practical result, and, secondly, that in situations where this is not the case, a final course of action is only to be decided upon after consideration of all the options that may be derived from the various ethical theories (2003: 200).) While many might tend to agree with Wenz and Callicott that two opposing theoretical perspectives cannot both be right, and thus feel inclined to reject strong pluralism, it remains a fact that in practice environmental disputes often do arise from the differing theoretical perspectives that the opposing parties, maybe even subconsciously, hold. For example, society’s *benefit* in having a public road (utilitarian perspective) may clash with an individual’s *right* to private property (deontological perspective). In such situations the strong pluralist does not simply insist that one of the perspectives is false and the other true, but instead recognises the validity in both perspectives on the basis of the conclusion that “a single answer does not exist, or ... our best analytical methods are not up to finding it” (Stone, 2003: 210). Given this impasse, what Wenz finds objectionable is that in one instance, for minor or spurious reasons, it may be the utilitarian option that will prevail, while in the next it may be the deontological option.

While rejecting the extreme case of pluralism, Wenz does, nevertheless, defend a position of moderate moral pluralism. This position allows for a single theory, but one which “contains a variety of *independent* principles, principles that cannot all be reduced to or derived from a single master principle.’ Whereas extreme pluralism involves a plurality of theories, moderate pluralism includes only a plurality of principles (in a *single* theory).” (2003: 224) From an

engineering and general perspective this distinction may seem somewhat semantic. A situation where the practical application of the various *principles* (in a single theory) may lead to conflicting actions, seems effectively not much different from the situation where different *fundamental perspectives* may lead to conflicting actions. Thus, even though Wenz tries to ameliorate the contradictions inherent in unchecked pluralism through his model of moderate pluralism, his approach cannot exclude the real possibility of incompatible prescriptions emanating from the different principles permitted by his model, and which as a result still leaves us with the possibility of intractable moral quandaries.

While Callicott tries to reinforce his argument for monism by claiming that the “best, most systematic, and thoroughgoing environmental philosophers cling to moral monism” (2003: 208), Light asks conversely “why [then] has the monism-pluralism debate continued?” This is so, Light feels, because “the body of moral theories developing in the [environmental] field were inadequately responding to the practical dilemmas of forming a moral consensus around environmental issues”. In his opinion only a pluralist approach “could adequately ignite the morally reflective passions of a critical mass of people needed to effect environmental change” (2003: 233). Thus Light (and Brennan, whom he paraphrases) in recognising the moral diversity in society on the one hand, and in discerning the need for concerted environmental action on the other, only see some level of consensual solution arising in a pluralistic, practical approach, which he labels “methodological environmental pragmatism”, and of which the “priority is to aid in forging a moral consensus on environmental issues” (2003: 234-237).

Given the self-evident heterogeneous nature of societies, nationally and internationally, and the diversity and lack of unanimity amongst the various environmental ethical theories, the conclusion reached here is that a pluralistic leaning would be the most realistic position to adopt. However, in a world where environmental problems are becoming ubiquitous and traverse national boundaries, the moral pluralism applied will need a level of integrity and a degree of cohesion that would transcend simple situational ethics or shallow cultural relativism. It is suggested that the inadequacy of these bland models of pluralism (or perhaps more accurately relativism) should be superseded by a more considered pluralistic approach known

as *environmental pragmatism*.<sup>95</sup>

In conclusion, it might also be noted that not all theorists see monism and pluralism as necessarily mutually exclusive opposites. Harvey (1999) makes an argument that they form a relationship where the one builds on the other through the mediation of social institutions.

According to this argument, universality [monism] always exists in relation to particularity [pluralism]: neither can be separated from the other even though they are distinctive moments within our conceptual operations and practical engagements. The notion of justice, for example, acquires universality through a process of abstraction from particular instances and circumstances, but becomes particular again as it is actualized in the real world through socio-ecological practices. The actualization and administration of justice crucially depend, however, upon the mediating institutions (those, for example, of law and custom) that help to translate between particularities and universals. (Harvey, 1999: 119)

This perception of the relationship between monism and pluralism (or between theory and practice, if Harvey is interpreted simplistically) harks back to Wenz's minimal pluralism, and is in itself an example of the type of thinking which informs environmental pragmatism.

## **3.2 BUILDING ON THE DIVERSITY IN ENVIRONMENTAL ETHICS**

### **3.2.1 Finding value in the diversity**

[M]uch of the work in environmental ethics to date has been committed to the often vocal discussion of antipodal conceptual issues – intrinsic versus instrumental value, anthropocentrism versus biocentrism, monism versus pluralism, and so on. The consequence of this discussion ... has been the field's conspicuous silence regarding concrete solutions to real world environmental dilemmas. (Minteer & Manning, 2003: 319)

Given the diversity of views that have developed in the field of environmental ethics, the possibility of a universal frame of reference emerging from it, that will uniquely distinguish sound from unsound environmental practice, seems remote. Hattingh, maybe in mock despair, asks, "How do I as a philosopher working in the field of environmental ethics respond to this

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<sup>95</sup> Environmental pragmatism is the subject of §3.2.2.

scenario?” (1999: 79) He then proceeds to show how this diversity in the field of environmental ethics may even be a strength rather than a weakness. Weston, makes the point that this field of study is still in its infancy, having, only received concerted attention from interested philosophers over the last four decades, whereas many other themes in mainstream philosophy may have a history of centuries. To thus expect the same degree of coherence, unanimity and authority from the field of environmental ethics as from other long established fields of study is not only unrealistic, but also dampening on this relatively youthful area of investigation. Instead, the uncertainty and experimentation that is characteristic of a new field of investigation, should be welcomed as it is from the richness of these diverse experiments that greater levels of unanimity will develop, and out of which the core values of environmental ethics will coalesce (Weston, 1998: 63-69). In the same vein Freeden contends that

Green ideology in its various manifestations is, however, thin-centered. It lacks adequate conceptual complexity to address the range of issues that mainstream ideologies have addressed over time. ... Does that make it a postmodernist receptacle for all values and none? Far from it. Green thought is imbued with a strong sense of desirable values, among which of course justice is important, but it mirrors the diversity and the interconnectedness of the world it is designed to preserve. (2003: 42-43)

Based then on the contention that environmental ethics is at an “originary stage” Weston draws three conclusions. Firstly he claims that at this stage of its development it is unlikely, if not impossible, to have an understanding “of what ethics of a culture truly beyond anthropocentrism would actually look like” (1998: 66). Although we have seen some novel stabs at non-anthropocentrism, the new ethic may not even be based on any kind of “centrism”.

Secondly, “exploration and metaphor become crucial in environmental ethics” as a prelude to the positing of “more precise analytical categories” (Weston, 1998: 66). Thus many of the new notions now being debated (for example, deep ecology) are developmental tools towards broadening our thinking. In effect they “serve as rhetorical devices, kinds of open-ended challenges to that which already exists. They serve to open up questions; not to settle them” (Hattingh, 1999: 80). In course of time some of these tools may fall into disuse and others may harden into generally acceptable environmental principles.

Thirdly, “the process of evolving values and practices ... is seldom a smooth process of progressively filling a fairly obvious earlier outline” (Weston, 1998: 67). Implied here is the

notion that we cannot, in this developmental stage, expect practice to follow from theory. Practice, in these circumstances, is not necessarily the application of theory, but it may, instead on occasion, rather inform theory. From this perspective Weston calls for *enabling environmental practice*, that is, the creation of “the social, psychological, and phenomenological preconditions – the conceptual, experiential, or even quite literal ‘Space’ – for new or stronger environmental values to evolve” (1998: 67). Freedden sees it as follows:

... one of the great attractions of environmentalism is its sensitivity to the concrete and to the particular, through its emphasis on action and on practices. The notion of practice is elevated, ... to the status of a core green principle. (2003: 38)

Norton (1994: 240-243) is another theorist who wishes to move beyond the theoretical debates between, *inter alia*, instrumental and intrinsic values, between anthropocentrism and non-anthropocentrism, and between monism and pluralism. Not infrequently the instrumental and anthropocentric stances conflate into a monistic position that promotes human interests against and at the expense of the interests of nature, which would, in contrast, require a stance more open to intrinsic valuation, non-anthropocentrism and pluralism. Norton arguing against this contestation, holds a more pragmatic view, which he expresses through

... an empirical hypothesis – the convergence hypothesis ... [which claims] that policies serving the human interests as a whole ... in the long run, will serve also the interests of nature, and vice versa. (1994: 240)

Elsewhere Norton (1997) explains the hypothesis further as follows:

... provided anthropocentrists consider the full breadth of human values as they unfold into the indefinite future, and provided nonanthropocentrists endorse a consistent and coherent version of the view that nature has intrinsic value, all sides may be able to endorse a common policy direction. (Minteer & Manning, 2003: 329)

What is emerging here seems to be a new position that does not cling to a central master principle, but instead moves away from monistic and theoretical debate; a position that recognises the value in a diversity of views in a contextual pluralism, and the instructive potential of an objective driven practice. In short this position may be equated to a pragmatic stance, and theorists have labelled it *environmental pragmatism*, and as such it becomes the topic of the next sub-section.

### 3.2.2 Environmental pragmatism

The discussions thus far may have created the impression that environmental ethics has evolved along “a steady stream of progress from anthropocentric individualism, to non-anthropocentric individualism, to non-anthropocentric holism” (Light, 1996b: 336). And some, such as Katz,<sup>96</sup> may seem to think that the last mentioned position represents the apex of the theoretical development of environmental ethics. Weston however, maintains that “ruling [the other positions] out by fiat [as Katz attempts to do] accomplishes nothing” (1996: 321). But, notwithstanding Weston’s call, what is one then to make of the apparent incompatibility between the various positions outlined above? Whether they are considered advanced or not, their monistic tendency sets them on a road of continuous reciprocal disagreement. Not one of these approaches seems to be able to muster a sufficiently broad-based acceptance, so as to be able to claim supremacy. As a consequence they all are somewhat lacking in the authority needed to universally prescribe sound environmental practice. In response to this inconclusive state of affairs a number of environmental ethicists have, more recently, proposed new types of approaches; approaches which are, firstly, more pluralistic, and secondly, more directly concerned with finding workable answers to practical environmental problems. Collectively these approaches have become known as *environmental pragmatism*, a new standpoint which may be characterised as follows:

- It is born out of frustration with the tendency of ethical theorists to become mired in long-winded, abstract debate about foundational principles while in practice environmental problems are in dire need of solution.
- It is pluralistic because of its refusal to be tied to just one foundational stance.
- It is contextual and believes that in many cases the same practical action may be derived from different foundational stances.
- It is committed to the resolution of practical environmental problems (Palmer, 2003: 32-33).

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<sup>96</sup> See Katz, 1996: 310-311.

According to Light there are two varieties of environmental pragmatism: “philosophical and metaphilosophical” (1996b: 330). These two approaches may, in simple terms, be described as pragmatism in *principle* and as pragmatism out of *necessity*.

The first of these positions, *philosophical pragmatism*, builds a new environmental ethical position around the basic tenets of the American school of pragmatism, as promoted by Peirce, Dewey and others. These philosophers argue that

[t]here are no innate beliefs, intuitions or other indubitable “givens” upon which our knowledge is built, or in terms of which the truth or meaning of concepts can be analyzed. To say a belief is true, ... is to say that the belief succeeds in making sense of the world and is not contradicted in experience. ... We have no absolutely clear, immutable concepts; we do have many concepts that are sufficiently clear and stable to let us make pretty good sense of experience. Experience, however, can at any time expose our settled beliefs as false, or reveal an unsatisfactory vagueness or confusion in our concepts ... Subjects and objects are not absolute entities; knower and known are inextricably twined together ... Subjects and objects are nexus of relations in an ever-shifting universe of complex relationships. (Parker, 1996: 22-23)

Out of the above emerges an “*essence*” of plurality, experience and relationships, which when expressed in an environmental ethic, attempts to dispose of the traditional antipodal divides discussed in the preceding sub-sections. According to Light this position “engages fully with the already established theories in environmental ethics on their own ground” (1996b:330), and therefore runs the risk of becoming as unyielding as they are. Although philosophical pragmatism is based on pluralism, it is in danger of being interpreted as a “dogmatic pluralism, committed to some version of postmodern relativism which admits no *possibility* for moral realism or foundationalism” (Light, 1996b: 330).

The second type of pragmatism, *metaphilosophical environmental pragmatism*, is more favoured by Light. According to him it provides “rules and principles within which environmental philosophy should be conducted” (Light, 1966b: 330). The aim here is to try to resolve practical environmental problems, by skirting the intractable theoretical debates, and focussing rather on the commonalities that the various theoretical stances may provide. In this sense,

... environmental pragmatists are not wedded to any particular theoretical

framework from which to evaluate specific problems, but can choose the avenue which best protects the long-term health and stability of the environment, regardless of its theoretical origin. (Light, 1996a: 172)

This does not imply that environmental pragmatists will not hold theoretical viewpoints of their own, but rather that they will be tolerant of other fundamental orientations, and that in a given context, they will be willing not to insist that their own foundational framework should hold sway, if by such willingness sound environmental practice is promoted and allowed to proceed. So while in ‘private’, they will argue for their own foundational perspective, in ‘public’ they will be reticent in this regard in order to avoid “too much confusion in the practice of a project that almost everyone can agree is a good idea: [for example] restoring damaged lands” (Light, 1996a: 174-177). And so, pragmatists of this ilk could argue that the values needed to reinforce environmental practice might be extracted, for example, from across the whole of the anthropocentric/non-anthropocentric spectrum. In other instances, the metaphilosophical pragmatist will reason that instrumental and intrinsic values are not mutually exclusive. Thus a good may have instrumental value because of the meaningfulness of its relationships to other things, but at the same time it may also have intrinsic value precisely because it *is* a significant entity in these relationships (Parker, 1996: 32-34). The pragmatic stance reflected by these examples may still not exclude the potential for conflict, but the conflict such as there may be, is of a more insubstantial nature (and hence resolvable) than what the case would be with the conflict between traditional monistic approaches, where the differences may be so fundamental that they may even frustrate the communication needed as a starting point on the road towards practical solutions.<sup>97</sup>

A concern which one may harbour around the pragmatist approach, is its inherent pluralism which will always be somewhat unpalatable to those of a more monistic inclination. But while, on the one hand, pragmatists are not monists, their approach cannot, on the other hand, be equated to the simplistic relativism of ‘anything goes’. Thus, in order to position the relativism of pragmatism somewhere between the extremes of monism (no pluralism) and absolute

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<sup>97</sup> To dismiss pragmatism, particularly of this type, on the basis of its potential for conflict, is to misread its strength, which is born out of its acceptance of diversity. By contrast monistic theories are weakened by internal inconsistencies, and when in external conflict with other monistic theories, are rendered impotent in terms of their capacity to prescribe universal solutions.

relativism (complete, unconditional relativity), the following table (see Table 3.1 ) of graded pluralism is suggested. The two strands of pragmatism described by Light are also incorporated into this table.

TABLE 3.1: PRAGMATIC APPROACHES ON A SCALE OF PLURALISM

Monism (No pluralism)	Metaphilosophical pragmatism	Philosophical pragmatism	Absolute Relativism
Environmental practice can only proceed on the grounds of the precepts of a master theory.	Environmental practice has to proceed, and while theory is left in abeyance for the moment, it is quite possible that greater theoretical understanding will emerge from the practice.	The idea of a master theory is fundamentally misleading. Environmental practice simply proceeds under the values that are relevant in the spatio-temporal context of the problem.	Values are inherently relative and hence not prescriptive for practice, which instead is more likely to proceed in terms of power relationships.

While in this study pragmatism of the metaphilosophical kind will generally be favoured, it might be useful to briefly overview Norton's *adaptive management* model (2005, 2007), which might fit more comfortably into the philosophical pragmatism category. As has been mentioned previously, Norton is frustrated by the bimodal debates that have characterised the field of environmental ethics, in particular the debate between those who ascribe instrumental values to nature and those who value nature intrinsically. Norton sees this debate as one which has stretched, unfortunately, beyond the confines of the field of environmental ethics, to now represent the opposing positions held by economists and environmentalists, with the former supporting the instrumental valuation of nature and the latter intrinsic valuation. These opposing camps have so entrenched their respective formulations of value that they are incapable not only of speaking to each other, but also of "capturing the actual range of values ... [the public] feel towards the environment ..." (Norton, 2005: 180). The task is thus not one of deciding whether instrumental or intrinsic valuation should hold sway, but rather one of determining "whether good reasons can be given for invoking a particular value in a particular situation" (Norton, 2005: 187). Seeliger understands Norton to be arguing that it should not be a requirement to

... maximise one particular good, i.e. intrinsic worth or economic efficiency ... [or that] all values be commensurable. The emphasis is rather on finding connectivity between the different value theories so as to establish development paths that are commensurate

with the variety of values that are upheld. (Seeliger, 2009: 76)

Not only did Norton find the endless “debates about whether to extend ‘moral considerability’ to various elements of non-human nature ... [disillusioning, but they have also] been, to say the least, inconclusive, and ... have had no discernible impact on the development of sustainability theory or on public policy” (Norton: 2007: 27). And so he turns to “a new environmental philosophy, a philosophy that is more geared to learning to be sustainable than in defining what kind of good nature has. This philosophy emphasizes social learning and community adaptation, and it derives its method more from the epistemology of pragmatism than from theoretical ethics.” (Norton 2007: 29)

Norton modelled his new philosophy on the adaptive management approach which had surfaced in such disparate disciplines as business management, experimental science, systems theory, industrial ecology, social learning and natural resource management (Seeliger, 2009: 79). (It is in the latter field in particular that it gained popularity.) Adaptive management can be described as:

... as a search for a locally anchored conception of sustainability and sustainable management, [that] sets out to use science and social learning as tools to achieve cooperation in the pursuit of management goals. (Norton, 2007: 30)

Extending the concept’s interpretation as a strictly scientific management process, it is Norton’s specific intention “to make environmental values, evaluation and social learning about values endogenous to the broader, adaptive management process” (2007: 37).

Norton bases his adaptive management approach on three intellectual pillars:

- a commitment to the unified method of naturalism (2007: 29; 30-33),
- a relationship between values and boundaries (2007: 30; 33-36), and
- a new approach to scaling and environmental problems (2007: 30; 36-41).

Norton’s unified approach to naturalism is based on a rejection of the Humean separation of ‘values’ and ‘facts’, specifically as it is underwritten by such theorists as Callicott and Sagoff, and instead he argues (*à la* Peirce and Dewey) that it is only through experience (active experimentation) that both descriptive and prescriptive assertions can be challenged and improved. This approach may be seen as “a form of methodological naturalism .. . [which]

while not expecting *deductions* from facts to values, relies on the open-ended, public process of challenging beliefs and values with contrary experience” (Norton, 2007: 33).

The second intellectual pillar of Norton’s adaptive management approach argues for the recognition that our values influence the boundaries of the models in which we frame environmental problems. This because adaptive management is an active “mission-oriented” science in which the participants are not neutral observers, but concerned stake-holders.

The values and interests of participants are coded into the choices they make to ‘model’ the problem – to bound the problem spatially, to form a temporal horizon, and to describe a function of the system that is considered problematic. These values are often embedded in the choices individuals and groups make when they choose/develop a ‘mental model’ of the problem they are addressing. (Norton, 2007: 34)

It is the multi-dimensional nature and temporal open-endedness of environmental problems that leads to Norton’s third pillar, in which he proposes a two-pronged axiomatic understanding of ecological systems and the observers of these systems:

(i) The system is conceived as composed of nested subsystems, such that any subsystem is smaller (by at least one order of magnitude) than the system of which it is a component, and (ii) all observations of the system are taken from a particular perspective within the physical hierarchy. (Norton 2007: 37)

In the case of the first axiom a multi-scalar approach to environmental problems, both in terms of space and time is predicated. This translates into a series of opportunities and constraints around which we have to make certain choices. The choices we make not only affect our survival but also the array of such opportunities and constraints that are available to future generations. In the case of the second axiom the value of the local context is underwritten. This applies not only to physical localness, but also, in terms of the social context, to local preferences and values.

From the foregoing description of Norton’s approach it should be clear that he has foreclosed on the master theory approach, and that he is firmly entrenched in a multi-lateral pragmatism that is characterised by experience in a spacio-temporal and value contextuality. It is this assessment of Norton’s approach as well as his rooting in the thinking of Peirce and Dewey, that inclines one to judge him to be amongst the cadre of philosophical pragmatists (in terms of the categories outlined in Table 3.1).

In their support for environmental pragmatism, Minter and Manning argue that pragmatist philosophers support a “robustly experimental and contextual view of individuals’ moral universes”, and that this view, in turn, underscores their “faith in the ability of human experience to produce from within itself the means for justifying and evaluating moral beliefs and values” (Minter & Manning, 2003: 320). In support of their argument Minter and Manning quote an empirical study based on a questionnaire survey, which indicated that while moral beliefs were indeed markedly pluralistic, this pluralism was not necessarily mutually exclusive. This observation, if extrapolated to society in general, would make general agreement in terms of environmental action possible, and also underline the democratic value inherent in the pragmatic approach (Minter & Manning: 2003: 321-325).

As an example of the application of the (metaphilosophical) pragmatic approach one might refer to the 1992 *Joint Appeal by Science and Religion on the Environment* led by the eminent scientists Carl Sagan, Edward O. Wilson, and Stephen Jay Gould, who attempted through this initiative to garner moral support from religionists for their environmental concerns. Daly is critical of this approach which he considered “a somewhat less than honest appeal by the scientists to a somewhat credulous group of religious leaders”, being as it were an “effort [by the scientists] to rouse public support ... [using] religiously based values that they themselves considered unfounded!” (1996: 19-21). However, the metaphilosophical approach does not insist on denying the disparate values and the intellectual contradictions that such a diverse group of scientists and religious persons might represent, but rather focusses on the potential positive outcomes of such a meeting of diverse minds.

And so, in the light of all the arguments and evidence accumulated above, and as already been mooted, this study will favour a more pragmatic approach (of the metaphilosophical kind, if one must be academic). However while pragmatists are all for working out problems on the ground, so to speak, they are not very explicit about those practical situations where the “convergence hypothesis” of Norton (1994: 240-243) or the “lexical rule” of Stone (2003: 200)<sup>98</sup> fails to produce the consensus needed for ‘sound environmental practice’ to take place. In a country like South Africa, with many and large cultural differences, and in which elements of both the

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<sup>98</sup> Stone suggests that a “lexical ordering” of the various solutions as arrived at from the different theoretical perspectives, might yield a pragmatic way forward (2003: 300).

‘North’ and the ‘South’ are present, such environmental impasses may not be unlikely occurrences. And when such intractable moral quandaries do occur, they will need to be resolved one way or another – preferably by way of common aspiration rather than by way of some other more crude approach such as political enforcement. But then, in what form could this common aspiration manifest itself? Could it be in the form of the integrative practice of *sustainable development*?

### 3.2.3 Sustainable development

The discussions up to now leads to the conclusion that a pluralistic, pragmatic model is likely to be the most effective approach in assessing the environmental soundness or otherwise of engineering practice. But although, in the present circumstances, a *pluralistic* approach might appear to be more productive, it also seems that many environmental ethicists (with the obvious exception of the environmental pragmatists), and many lay people too, may favour a *monistic* approach.<sup>99</sup> While one may ascribe the rise of pragmatism to the failure of the monists to reach consensus, the advantages of monism (internal coherence, universal algorithms of application, closure, etc.) remain attractive, and it may not be unreasonable to think of pragmatism as filling the gap until a universally acceptable monistic theory emerges (if that were ever to happen). It is in this nexus of urgent environmental problems, the attraction of monism and the necessity for pragmatism, that the notion of *sustainable development* comes to the fore as the most hopeful strategy.

Since being brought into prominence in the so-called Brundtland Report in 1987, the concept of sustainable development has been widely accepted by governments, business organisations and development agencies as the most suitable strategy for development. The concept of sustainable development has evolved to become not only the focus of one of the largest international conferences up to that time, the so-called Earth Summit<sup>100</sup> in Rio de Janeiro in 1992, but it also repeated that achievement at the *World Summit on Sustainable Development*

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<sup>99</sup> The abundance of monistic theories, the wide spread of monotheistic religions, such as Christianity and Islam, the frequent application of the utilitarian and rights-based guidelines in public policy-making, and the broad adherence to the liberal-capitalist system in most developed countries all suggest that society in general leans towards monistic approaches.

<sup>100</sup> The United Nations Conference on Environment and Development (UNCED).

held in Johannesburg in 2002. It goes without saying that it again served as the focal point of the Rio+20 Conference held in Rio de Janeiro in June 2012. Evidently the idea of sustainable development has infused most, if not all modern development agendas; this despite the fact that the concept itself still lacks clear definition. It may precisely be this vagueness of definition which affords such universal popularity to sustainable development; as a result of its ambiguity many read into it the interpretations and expectations that suit their own agendas (Ngobese & Cock, 1997: 256).<sup>101</sup>

At the beginning of this study the environmental dilemma was characterised as the clash of social development initiatives and environmental concerns. And, sustainable development, it seems, may be the bridge between environmental and social issues. Thus, accepting the premise of a general yearning for monistic solutions, and recognising simultaneously the wide-spread use and acceptance of the concept of sustainable development, this study will proceed by predicating that sustainable development should be used as the singular guiding strategy for integrating development initiatives and environmental concerns. But having said that, it must be acknowledged straight away that while sustainable development may give the impression of a monistic approach, it is in fact, as has already been indicated, a vague concept which can be interpreted variously.<sup>102</sup> It can be stretched to fit a spectrum of values, as will be further elaborated upon in later chapters. As a result the application of sustainable development in practice will thus require more of a pluralistic, pragmatic approach. In other words, while it seems that on some theoretical level sustainable development might represent a reasonable coherent approach with monistic appeal, on other levels a clear need for pluralistic pragmatism emerges.

These few cursory comments on sustainable development are obviously insufficient to explain

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<sup>101</sup> Unsurprisingly, it is this lack of clarity that is often the target of the critics of sustainable development.

<sup>102</sup> The continued and increased presence of environmental threats (e.g. climate change) leads some to believe that sustainable development is a failed strategy. In an article entitled “The End of Sustainability”, Benson and Craig argue that it needs to be replaced by the new concept of *resilience*. Sustainability is seen as a static and unattainable, whereas resilience is dynamic and aimed at addressing inevitable changes. However, it is argued here that the “failure” of sustainable development is a societal failure rather than a conceptual failure, and that the detractors of sustainable development fail to recognise its broad scope, and that it is an evolving strategy. As such, resilience can be seen as a component of sustainable development rather than a substitute. (Folke, *et al.*, 2009; Rees, 2014)

why this concept should fulfil the role of a guiding strategy. Hence the whole of Section B of this study will aim at giving the concept more substance and depth in order to justify its selection as the strategy of choice for development activities.

### **3.3 CONCLUSION**

While it has been mooted that the route of sustainable development is the way forward, it would seem inappropriate to close the discussion on ethics without coming to some conclusion as to what ethical basis would undergird the application of sustainable development. Thus far the discussions in this chapter have been characterised by contrasting ethical standpoints. Notwithstanding this ethical uncertainty an attempt will be made in the next chapter at deriving, in the light of the insights developed thus far, an ethical statement so widely acceptable that it may serve as a foundation for sustainable development.

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## CHAPTER 4

### A BASIC ETHICAL MODEL FOR SUSTAINABLE DEVELOPMENT

Most important, if we are morally serious, we must know on what grounds it may be said that sustainable development is a *true* ethic for human beings on planet Earth. (Engel, 1990: 1)

While it has now been concluded that the notion of sustainable development will be the direction in which this study will search for a resolution of the environmental dilemma, it has also been acknowledged that this concept can have differing and possibly even contradictory interpretations. Obviously these will need to be addressed, and it goes without saying that this needs to be done from a sound ethical basis. In other words, if some interpretations of the sustainable development concept can be considered ethically more correct than others, then it is these interpretations which need to be identified. The preceding ethical discussions have clarified many useful ethical concepts, but a single, coherent master narrative has remained elusive, and it appeared that, at best, a pragmatic, somewhat pluralistic approach might be the most feasible way to proceed. However, as the attractions of monism still remain, one wonders, given the ethical insights that have been developed, whether it might not be possible to distill, from the preceding chapters, ethical principles so basic that their general acceptance is practically universal, and which therefore could inform the thinking and practice around sustainable development. It needs to be reiterated that the multi-dimensional nature and wide manifestation of environmental problems dictate that the response to these problems needs to be equally widely ranging and acceptable. It appears that sustainable development, given its wide endorsement, has the potential to be this response at the level of strategy. But if sustainable development is to fulfil this role adequately it will need an ethical underpinning equally widely endorsed. And so it is the quest for this broadly acceptable, ethical foundation that will be the focus of this chapter. If such an ethical foundation can be articulated, it will not only inform the discussion on sustainable development that is to follow in later chapters, but it will also be the ethical legitimation for the practice of sustainable development.

#### 4.1 SETTING THE SCENE

Looking back at the broad field covered in the previous chapters, the scenario emerging from it appears

to be a pluralistic melange of ethical ideas, sometimes contradictory and incompatible, and from which no unambiguous, common canon seems to emerge. Perhaps, thus, the most obvious conclusion to surface from the preceding discussions is that there appears to be no single, universally agreed upon, (environmental) ethical model or theory, and that the putative ideal of a monistic, ethical grand narrative, remains unfulfilled. From an environmental ethics perspective some may see this as a serious obstacle to the quest for *ethically justified* and *universally applicable* guidelines for sound environmental practice.<sup>103</sup> But also on a broader front, for life in general, when faced with the pluralistic, non-directional ethical landscape as it emerged from the preceding chapters, one may, instead of experiencing ethical confidence, be constrained to feelings of uncertainty and doubt, which may be construed as a manifestation of a post-modern, existential ‘angst’.<sup>104</sup>

It has been argued that humankind has experienced, in the course of evolutionary history, a not dissimilar moral vacuum, and that as a consequence religions developed around the need to provide “a foundation for social order and moral edification”, particularly as human tribes aggregated into larger groupings where informal moral controls became ineffective. The other supposed function of religion was to explain the physical world around us (Shermer, 2004: 5, 46). However, in recent times, the rapid advances made by modern science, particularly in Western societies, have invalidated many of the traditional scientific insights incorporated into religion,<sup>105</sup> thereby also emasculating its moral authority. It is in this context of moral uncertainty, that some post-modern philosophers have tried to claim moral relativism to be *the* existential reality. To some this may imply a moral free-for-all, but Bauman, a post-modernist himself, asserts that:

... the novelty of the post-modern approach to ethics consists first and foremost not in the abandoning of characteristically modern moral concerns, but in the rejection of the typically modern ways of going about its moral problems (that is, responding to moral challenges with coercive normative regulation in political practice, and in the philosophical search for absolutes, universals and foundations in theory). The great issues of ethics ... have lost nothing of their topicality. They only need to be seen and dealt with in a novel way. (1998: 3-4)

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<sup>103</sup> Of course it has been suggested that environmental pragmatism is a way around this obstacle.

<sup>104</sup> And maybe this could be the reason why some fall back on reassuring religious dogma.

<sup>105</sup> Being the dominant Western religion, the focus here is essentially on Christianity, and as a case in point, one may refer to the early Christian belief that the earth is at the centre of the universe. When the scientific validity of this belief was challenged by the likes of Copernicus and Galileo, the Christian church reacted by trying to suppress these views and ostracising those who held them (Koestler, 1969: 431-503).

In similar vein this study concurs that the ethical discussions conducted thus far are not pointless. Rather it finds value in attempts to draw, in a pragmatic way, ethical directives from the discussions, which can then be used to guide the objectives of this study. As has been stated here above, this search for ethical directives will here be concentrated into a search for a widely acceptable ethical justification for sustainable development. Such an ethically justified version of sustainable development, will then become the framework from which guidelines for sound environmental practice can be derived. For guidelines to be effective guidelines, they also have to enjoy a reasonably wide level of acceptance amongst those for whom they have been written.<sup>106</sup> In this context acceptance does not necessarily mean acceptance of the detail of the guidelines, but rather acceptance of their foundational basis and general thrust.

To reiterate, a major attraction attached to the notion of sustainable development is its wide acceptance, and hence it is logical that the ethical values used to undergird it, should also enjoy an equally wide acceptance. The ideal of universality is not only alluring, it is moreover deemed to be necessary, given the urgency and ubiquity of the environmental problems that confront us. To summarise, if suggestions for ethically justified environmental practice are to be put forward, and these are to find ready acceptance, they will have to be formulated around a moral basis that is readily acceptable to society in general, and in particular to the practitioners who are the focus group of this study. The question that now remains is: can such an ethical foundation be found, and if so, what will it look like? In response to this question, the task of this chapter has become that of trying to identify a number of basic propositions that together might be a model for such an ethical foundation.

## **4.2 A PROPOSED ETHICAL MODEL FOR SUSTAINABLE DEVELOPMENT**

The ethical model being proposed in this chapter is made up of a number of propositions. These will be discussed in full here below, but in preview the following can be stated about them. Proposition A will aim to define the *focus* of the proposed ethical model. Proposition B will try to clarify *how*, that is on what basis, one can decide what the ethical ‘good’ is. In proposition C the nature of the prime ethical *good* itself, that is, the foundational value required to undergird sustainable development, will be addressed. The theme of this main ethical good will be carried further with a discussion on its

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<sup>106</sup> Assuming here that coercion is not a realistic alternative.

*cognate values* in proposition D. Finally in proposition E the handling of *cultural values* in the proposed ethical model will be discussed. The combined purpose of these propositions is to put forward a valid, yet succinct moral model that can inform sustainable development practices.

#### **4.2.1 Proposition A: The focus of the proposed ethical model is on the impact of human activities on the environment**

At first appearances it may seem that this proposition does no more than state the obvious. But there are some implicit assumptions lurking in the phrasing of this proposition that need to be identified and explicated. In simple terms this proposition requires consideration of the morality of human actions with respect to the environment. Stated in the form of a question this proposition might read, “What is the proper way for humans to *act* towards the *environment*?” (The emphasised words are crucial to this proposition, and hence need to be explored further and clarified.)

Starting the discussion by focussing on the *environment*, the first task is to unravel the assumptions subsumed under use of this term. The leading question articulated in the previous paragraph is, in all probability, mostly raised in the context of the interaction between human beings and the *natural* environment. However, given the link which has already been established between the social and the natural environments, and thus the need for sustainable development to address problems which are correspondingly wide ranging, this term, the environment, needs in many instances, to be interpreted much more broadly, more or less along the lines suggested earlier.<sup>107</sup> Accepting this broader interpretation of the environment means that we will be concerned about the morality of the social interactions that occur between human beings (the field of *ethics*), as well as the morality of the interactions between humans and the natural environment (the field of *environmental ethics*).<sup>108</sup> In this broadened context then, it may for the purposes of the discussions to follow, be useful to use the term *others* in

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<sup>107</sup> In Chapter 1 it was suggested that the environment could be envisioned to include over and above its usual bio-physical components also issues from the social, political, cultural, historical and economic domains.

<sup>108</sup> One could argue, given this broad understanding of the environment, that the distinction between *ethics* and *environmental ethics* has become blurred and hence is of less importance, but for the sake of consistency and convenience the designation *environmental ethics* will still be retained for those ethical issues that relate, in the main, to the natural environment.

place of the term environment. One could rephrase Proposition A then so that it reads: the focus of the proposed ethical model will be on the moral implications arising from the impact of human activities on *others*, be they people, animals or other elements of the natural or social environments.<sup>109</sup>

Returning to the question posed above, and having defined more specifically the range of the human/environment interface, the next point of clarification relates to the fact that the attention is on the *actions* that occur across this interface. Actions, in this context, refer to human activities that have an impact on the environment, and the interest here is on the morality, that is to say, the rightness or wrongness, of these actions.<sup>110</sup> As conceived here these *actions* across the human/environment interface, involve actors, and recipients or others, to use the term introduced above. An act itself is preceded by an intention on behalf of the actor, and ends with a result that has a bearing on the recipient. The morality of the act depends on essentially the intention and the result; the act itself is devoid of moral content. In many instances it is the morality of the intention of the action that weighs most heavily, as the result of an action may be somewhat unpredictable, or only fully known in the long term, and in the interim it may be subject to many other influences. Also, in some cases the intention of the actor may be good, but the result, through no direct fault of the actor, could turn out to be bad for the recipient. This is why, for example, in a court of law, the act of killing another person may be framed as murder, if there has been a clear intention to kill, but if there has been no intention to kill, the charge may be downgraded to manslaughter. In terms of sustainable development practice however, the opinion held here is, that the result or outcome of an act is often equally if not more important than the intention. So, for example, if the objective is the conservation of the

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<sup>109</sup> The heterogeneous nature and extensive range of the elements that make up the collective here termed *others*, reflects the idea that the subjects deemed potentially worthy of moral consideration extend beyond the human sphere, as previously discussed under the ethical extensionism approach. This significant conclusion means that the term *others* certainly warrants further consideration, and hence this will follow in a later proposition. (See §4.2.4)

<sup>110</sup> The notion of focussing on actions is not particularly unique, as much of the rhetoric used in the traditional ethical theories also focusses on actions. Most obvious in this regard is utilitarianism with its singular emphasis on the outcomes of actions. Even the deontological approach may be said to be based on rules that categorise certain *actions* as either good or bad. It may also be argued that most of the virtues that one would encounter in the virtue ethics theory (such as honesty, for example) are those which imply a certain way of behaving (acting) towards others. (It may be said that there are theorists such as Cafaro who ascribe to virtues the deeper purpose of serving “enlightened self-interest” (1997: 53), but such an egoistic approach is, for the purposes of this study, specifically excluded, and later in this sub-section this point will be re-emphasised.)

natural environment, it is less important whether this is achieved from an anthropocentric (instrumental value) motivation or from a non-anthropocentric (intrinsic value) motivation; what is more important is that the environment is conserved. This is simply a pragmatic stance. While equally convincing arguments can be formulated for the conservation of the natural environment from either the instrumental or intrinsic value perspectives, a pragmatic stance will accept that if both approaches lead to conservation it is not particularly critical which value orientation drives the conservation action.<sup>111</sup>

The point needs also to be made that as the emphasis in this study is on environmental practice, that which might be termed private morality, is not at issue. In this arena an act that has no impact on others is excluded from moral consideration. By the same reasoning thoughts, ideas, musings, etc. are considered beyond the scope of morality, except maybe to the extent that they can contribute towards the *intention* or realisation of actions that have some impact on others. This approach corresponds to Leopold's (1966: 239) view that "[a]ll ethics so far evolved rest upon a single premise: that the individual [the human actor] is a member of a community of interdependent parts [the environment, the recipients or others]", implying that it is only what happens across the human/environment interface that has ethical significance.

In summary, it may then be stated that proposition A aims at clearing up any misunderstandings that may develop as to where the focus of the proposed ethical model for sustainable development will be concentrated. As has been outlined above, the focus is on the morality of human *actions* on the environment. The morality of the actions is assessed through the intentions associated with them, and through the results achieved by these actions on the environment. The environment has also been designated as *others* in order to underline the intended broad inclusivity to be applied to this concept.<sup>112</sup>

A very significant point emerges from the Leopold argument quoted here above. It is the notion

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<sup>111</sup> T. S. Elliot is reputed to have said, "Tis the highest treason to do the right thing for the wrong reason." This view is discounted in this study for the simple reason that many environmental issues are of such an urgent nature that the "right" actions are required as soon as possible, irrespective of what their underlying motivation may be.

<sup>112</sup> It could be argued that the use of the term *others* may seem to preclude elements of the environment such as species and ecosystems from the status of moral considerability, a circumstance which some theorists specifically repudiate. There is reason therefore to provide further clarity around the use of this term and this will be done in §4.2.4.

that all ethics have *evolved*, originating firstly in the relationships between individuals, and then progressing to the relationships between the individual and society, and at the moment and in future being extended to include the relationships between humans and the natural environment (Leopold, 1996: 238-239). This notion of an *evolving ethics* is further elaborated on in the following sub-section.

#### **4.2.2 Proposition B: Universal evolved moral intuitions inform our ethical thinking**

Turning to the task of *how* one can go about finding the ethical good, one can first look at how the traditional theories approached this task. It can be seen that under the natural law tradition, for example, the good is associated with the ‘final cause’ of a person or an object. Deontologists, on the other hand, define the good on the basis of a universalizable moral rule. Utilitarians, without much fuss accept happiness<sup>113</sup> as the sought after good, and then devote their energies to maximising this good. The virtue ethics approach equates the good to certain human character traits.

The question being looked at here is *how* these various ethical theories have arrived at their respective conceptions of the ethical good. It seems that all do this, to a larger or lesser degree, through the process of rational thought. The ‘final cause’ of the natural law tradition must, one would say, be the product of rational selection. In deontology rationality is a prerequisite in determining the Kantian ‘categorical imperative’. The utilitarian, it would seem, cannot maximise the ethical good other than by rational thinking. Rationality in the virtue theory is perhaps more implicit. But how does the virtue theory proponent decide which character traits are virtuous? Surely that also requires rational thinking.

But if these various ethical theories employ rationality in their development and application, it has not ensured that they all have the same conception of the ethical good. For the natural law protagonist it is the ‘final cause’, for the utilitarian it is happiness (say), and in the virtue theory it is certain character traits. Deontologists are less explicit about their conception of the ethical good, except perhaps to say that it is evident to all who can rationalise it into a universal rule.

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<sup>113</sup> For the sake of the argument it is not necessary to now consider other nuances of the utilitarian good, such as self-fulfilment.

Given this variety in the conception of the moral good, it is not too difficult to conjure up, in each of these approaches, as critics have done, a situation in which the application of the basic rule or dictum of that approach delivers unacceptable moral outcomes.<sup>114</sup> It is such shortcomings in the application of these theories that are the reasons why they each fail to convince as a grand narrative. Yet it is not the ethical good of each theory that is inherently immoral, because there are many applications of these theories in which they meet their objectives in ways that most would regard as highly moral. This is apparent from the many societal norms, procedures and institutions in which these theories find application.<sup>115</sup> Is it not possible that the ethical good as articulated in each of the approaches, is in fact a subsidiary expression of an even more fundamental ethical good, which they all may share, but which has not been explicitly expressed as such in each of the theories? And does not the acceptance by all of these ethical traditions (despite their differences), and for that matter even by society as a whole, of the notion of an ethical good<sup>116</sup> support such a conclusion? *How* one can find such a fundamental moral good will be the focus of this sub-section, and then propositions C and D to follow, will be aimed at articulating the “*essence*” of that good.

Before proceeding with the task of investigating *how* the ethical good of society can be found, it needs to be acknowledged that this positing of ethical good may be charged with harking back again to a monistic ideal. Earlier in this study the monistic approach has already been found wanting, and more favour placed upon the pluralistic approaches inherent in pragmatism. In answer to this charge of latent monism, it needs to be said that the pluralism that underlies the recognition accorded to the applicability of the various traditional ethical approaches in certain situations, still remains intact. Furthermore it is here contended that (metaphilosophical) pragmatism does not argue, in an *a priori* manner, that an ethical good is illusory, but rather that if a universal theoretical justification for such a good is lacking, then guidelines be sought from ethical practice. This approach does not preclude the possibility of ethical universals, or

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<sup>114</sup> For example, the utilitarian theory applied in an unfettered manner, will warrant the removal of all the vital organs of one healthy person in order to implant these into many persons who are in need of such organ transplantations, thereby allowing for a net increase in happiness. However most people would find such a suggestion preposterously unethical.

<sup>115</sup> For example the human rights culture is essentially of a deontological nature, public policy often finds expression in utilitarian terms, and the human virtues such as honesty and trustworthiness are widely valued.

<sup>116</sup> Exceptions may be the most rabid post-modernists and nihilists.

the possibility that they may emerge from such practice. So for the moment the charge of monism is not considered a fatal flaw. (It will be shown later, in §4.2.5, that the moral model being proposed in this study, allows for both monistic and pluralistic trends.)

Evidence that society accepts the notion of an ethical good can be found in the fact that all reasonable people, many of whom have no detailed knowledge of any of the ethical theories, seem to accept that certain actions are immoral. Furthermore it seems that some actions, such as murder for example, enjoy near universal condemnation. Harris, *et al.* (2000: 32) speak of a “common morality” which is a “common stock of basic beliefs about moral standards, rules, and principles” that are shared by all human beings. A number of such common moral traits, specifically identified by Harris, *et al.* are

[f]air-mindedness, self-respect, respect for others, compassion, and benevolence toward others ... [D]espite individual differences in their strength, scope, and constancy, these traits can be found to some degree in virtually all human beings. (2000: 33)

While many argue that society’s ethical norms are culturally determined, the apparent universal condemnation of murder (and such like crimes), and the near universal human traits listed by Harris, *et al.*, hint at the possibility that human beings, at a very basic level, share a common moral intent. The argument to be pursued here is firstly, that this moral intent or instinct is an *evolved* human characteristic, and secondly that this moral intent, as a result of its evolutionary foundation, can be perceived *intuitively*,<sup>117</sup> in contrast to the rationality discerned in the traditional ethical theories.

Some ethical thinkers (as has been suggested in a previous sub-section) portray moral beliefs as if they are objective moral facts, waiting to be discovered or proven true or false by theorists (Hepburn, 1995: 596). Moral truths are then accepted by humankind, in much the same way as we come to believe in the laws of scientific theories. In this sense they are then not only objective but also timeless. As a counter to this realist interpretation, the existentialists find meaning in human experience itself – their morality is to make life choices with integrity, but the choices themselves are neither right or wrong, fundamentally (Thompson, 2006: 97-98). Of these two opposing perspectives, the first finds its assumption of objective ethical facts

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<sup>117</sup> Intuitionism argues that the moral good is self-evident (Thompson, 2006: 37).

muddled by the existence of a multiplicity of sometimes contradictory moral positions, while the existentialist approach cannot easily escape the charge of relativism, a position that society in general seems to discount. Another view which sees human morality emerging from moral intuitions, recognises some truth in both of the opposing perspectives outlined above. It recognises some objectivity in those basic moral intuitions that all humans share, while simultaneously accepting that extensions of these intuitions can be heavily shaped by cultural influences so as to appear quite different, and maybe even contradictory. The idea that we access our basic ethical values through intuition is not incompatible with the ideas of some environmental theorists. For example, Humphrey (2003: 45-75) shows that Naess' deep ecological approach<sup>118</sup> builds strongly on an intuitive base, and even that Taylor's biocentric approach,<sup>119</sup> which although Taylor explicitly disavows the validity of intuitive insights, relies at an implicit level on intuitive perceptions.

How do we come by such moral intuitions? Why do human beings exhibit a moral sense? Cannot our evolutionary heritage be the source of our moral commonalities?<sup>120</sup> It seems abundantly clear that animals have no, or a hardly detectable, moral sense, compared to human beings.<sup>121</sup> If we thus presume that our prehistoric ancestors had characteristics similar to those of the modern day great apes, who like the other non-human animals have no (in the human sense) morals, and that in modern human beings a moral sense is a common characteristic, we cannot avoid the conclusion that our psychological ability to have a moral sense *must have evolved over time*.<sup>122</sup> By moral sense is meant the ubiquitous human characteristic of being able to discern right from wrong. Darwin not only expounds the evolutionary background of this moral sense, but further claims

... that of all the differences between man and the lower animals, the moral sense

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<sup>118</sup> See §3.1.3.

<sup>119</sup> See §3.1.3.

<sup>120</sup> It should be evident by now that the discussion in this sub-section will show many correspondences with Shermer's evolutionary ethics and his bio-cultural model (see §2.2.5), the "essence" of which is endorsed by this study.

<sup>121</sup> Shermer does discuss the evidence of so-called premoral sentiments in animals (2004: 36-31).

<sup>122</sup> Dawkins explains in detail how 'reciprocal altruism', for example, can become an 'evolutionary stable strategy' when individuals who possess the characteristic continue to multiply in a population at the expense of those who are not inclined towards this disposition (2006a: 166-188).

or conscience is by far the most important. This sense ... has a rightful supremacy over every other principle of human action ... (1994: 43-44)

But having acknowledged the universality and evolutionary nature of the human sense of morality, it seems necessary to then also immediately recognise that we have (quite evidently) superimposed on our psychological moral evolution the impact of human culture. Hauser explains that we have evolved

... a universal moral grammar that enables each child to grow a narrow range of possible moral systems. When we judge an action as morally right or wrong we do so instinctively, tapping a system of unconsciously operative and inaccessible moral knowledge. Variation between cultures in their expressed moral norms is like variation between cultures in their spoken languages. (2008: 455-456)

Not only does human culture radically shape our morals, but given the dynamic nature of culture, one can also expect its impact to be temporally variable, causing our moral norms to change over time. However the moral development due to cultural change occurs over much shorter time intervals compared to the time spans needed for our moral instincts to evolve (Smith, 1995: 409; Wellman, 1988: 274). Singer puts it as follows:

Cultural evolution is distinct from genetic evolution in two important respects. First cultural change can spread through a group very rapidly. ... [It] can have an effect on the behaviour of the whole group within a single generation ... Genetic change, on the other hand, takes many generations to spread through the group ... Second, whereas genetic change is random and hence blind, cultural change can be conscious and directed. (1997: 120)

Some theorists take the evolutionary component of our moral sense to be our *ability* to moralise, while the cultural component of our moral sense manifests itself as the *content* of our morals, that is to say, our moral norms. Shermer puts it as follows:

While cultures may differ on what behaviours are defined as good or bad, the moral sense of feeling good or feeling bad about behaviour X (whatever X may be) is an evolved human universal. (2004: 20)

If, as has been said, human beings share the ability to moralise, but the outcomes of our moralising are largely culturally determined, we may still be trapped in a quagmire of moral relativity, and that would sink our hopes of finding the moral universal(s) deemed as necessary to formulate ethical guidelines for sustainable development. However, notwithstanding the cultural diversity evident in our ethical norms, there still remain those few ethical themes that

seem virtually common to all cultures.<sup>123</sup> Are the widespread manifestations of these themes in human society coincidental or could they be expressions of some common moral instincts that we inherited through our evolutionary history? Taking extracts from Charles Darwin's *Descent of Man* Nash claims that:

Darwin recognised rudimentary ethics in the 'social qualities' of animals, and argued that cooperation or 'mutual aid' within species had direct survival value and hence were naturally selected ... Once human societies appeared and morality or ethics began to evolve from 'social instincts,' it was extended [culturally] by education and emulation ... 'eventually becom[ing] incorporated in public opinion'. (1998: 44)

What is being suggested here, is that the levels of simple altruism that can be discerned even in animal behaviour, are the evolutionary building blocks of our most basic moral norms. In other words, humans have commonalities in their moral norms which are rooted in their evolutionary history. The theme of altruism will be picked up again when Propositions C and D are discussed, but for the moment, the attention will remain focussed on *how* such ethical values have developed in humans.

To reiterate, while our moral intuitions may be heavily affected by cultural conditioning, there seems to be enough evidence to suggest that human beings have in their deepest psyche evolved some moral precepts, some of which are practically universal. Dawkins (2006a: 189-201) explains how this may be possible by positing the concept of a *meme*. A meme fulfils the same role in bio-cultural development as do genes in the 'natural selection' process of our biological evolution. In this context he asserts:

Just as genes propagate themselves in the gene pool by leaping from body to body via sperms or eggs, so memes propagate themselves in the meme pool by leaping from brain to brain via a process which, in the broad sense can be called imitation ... If [an] idea catches on, it can be said to propagate itself, spreading from brain to brain. (2006: 192)

Dawkins continues by quoting N. K. Humphrey:

When you plant a fertile meme in my mind you literally parasitize my brain, turning it into a vehicle for the meme's propagation just the same way that a virus may

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<sup>123</sup> The list of common human traits mentioned by Harris, *et al.* (2000: 33) come to mind here. Shermer too provides a list of universal human traits, no less than 202 of them, which according to him provide not only "a demonstration of the universality of morality, ... [but also] further evidence of its evolutionary heritage" (2004: 285-292).

parasitize the genetic mechanism of a host cell. (Dawkins, 2006a: 192)

If the meme-theory and its association with the gene-theory is correct, it accounts not only for the cultural variation in our morals, but also for the commonality in our most basic moral values that have evolved over eons, and which are more resistant to short term cultural pressures.

Even realists, who assume that our basic ethical values are objective realities, can be accommodated in the evolutionary approach, as one can still argue that it is our *perception* of these realities that has evolved progressively over time to such an extent that they have become concretized in the human psyche. Alternatively it may be that it is these basic ethical values themselves that are evolving, and that over time some of the memes representing these values have become near universal components of our value system which persist across generations. But whatever the case, the net result is that with time our experiences reflect some persistent ethical patterns which are indicative of some deep-seated commonalities in humanity's most basic moral values.

Having accepted that the moral development of human beings can be explained by the bio-cultural model, the next question is whether such moral changes, as have been noted over time, represent a progressive *improvement* or not. Assuming that we can agree on what we mean by improvement, we can see that Dawkins is of the opinion that there is improvement. In respect of cultural evolution he says:

[f]ashions in dress and diet, ceremonies and customs, art and architecture, engineering and technology, all evolve in historical time in a way that looks like highly speeded up genetic evolution, ... As in genetic evolution though, the change may be progressive. There is a sense in which modern science is actually better than ancient science. Not only does our understanding of the universe change as the centuries go by: it improves. (2006a: 190)

Even if the progressive moral advancement of humans is a debatable assumption, it still seems fair to conclude that in some respects the present moral standards are perceived to be more advanced than those of previous times, particularly if these are assessed over longer time spans. In the shorter term it may appear that cultural influences override the tendency of moral

advancement, so that there may even be significant regressions.<sup>124</sup> But in general one may argue that basic morals have improved over time, and that some of these moral advances have become so solid that they appear to be irreversible. To repeat an illustration used previously, perhaps the most seminal, relatively recent, example of this advancement in moral awareness or ethical standards is to be found in the abolishment of slavery. Over a period of time a practice which once was deemed everyday and acceptable, became unacceptable and immoral. Significantly too in present times slavery is so universally rejected and fiercely condemned that the moral advancement that it represents seems quite irrevocable.<sup>125</sup> Other examples of progressive moral development might be seen in the modern human rights movement and in the emancipation of women. Generally it seems that certain ethical values can, in time, cultural and other differences notwithstanding, reach a status very close to being absolute, and one could assume that such values must be in close accord with those basic ethical intuitions which are deemed to be part of our evolutionary heritage.

It also stands to reason that as cultures intermingle, directly or through media such as TV, or the Internet, and what may be called the ‘global village effect’, the tendency is there for culturally based values to converge and even coalesce. One may argue that in South Africa, for example, those of European descent have adopted (in principle) African cultural values such as ubuntu, and indigenous peoples have adopted European or Western values such as democracy.

Another aspect of moral development that needs to be briefly commented on, is the moral development that occurs in any particular individual as he or she matures. In this regard Kohlberg has proposed a model consisting of six developmental stages, ranging from simple obedience in a child to the acceptance of universal moral principles in adults. While, according to this model, everyone goes through these moral development stages in a fixed order, it does not necessarily imply that everyone will reach the final stage, as some adults may operate at,

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<sup>124</sup> For example the Nazi atrocities that occurred during the Second World War in Germany may be regarded as such a regression, but that it was of a temporary nature seems to be borne out by the fact of the wide-spread (including German) condemnation that has subsequently been heaped on these Nazi misdeeds.

<sup>125</sup> Apart from blatantly criminal acts of slavery, there are some cultures, it seems where subtle forms of slavery still persist. (See <http://en.wikipedia.org/wiki/Slavery> [accessed 5 June 2012].)

say, the fourth or fifth stage (Vesilind & Gunn, 1998a: 20-23).<sup>126</sup> While the details of Kohlberg's model may be somewhat contentious, it would seem reasonable to affirm the broad thrust of his argument of moral awareness growing in individuals as they mature.<sup>127</sup> This is borne out by our experience of the diverse levels of moral sensibility exhibited by children growing into adulthood, and this seems to happen across cultures. McCuen, while not adhering to Kohlberg's strict rules of progression, proposes a similar layered model representing six levels of professional engineering morality (Vesilind & Gunn, 1998a: 23-25).<sup>128</sup>

The main conclusions reached in this sub-section then is that the most basic of moral intents in human beings derives from our *evolutionary* history, which implies firstly, a *near universal* manifestation of these moral intents, and secondly, that they are perceived somewhat *intuitively*. Superimposed on these basic moral intuitions are our *cultural values*, which can show a lot of variation, but which seem to reflect progress over time, and which may also show further convergence due to the processes of cultural exposure and mixing. Finally, while human beings experience moral development as they mature, the extent of this development may be more in some individuals than in others. (This latter point could be one reason why professions should have a code of conduct.)

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<sup>126</sup> Kohlberg's theory of moral development constitutes six identifiable developmental stages, each more adequate at responding to moral dilemmas than its predecessor.

Level 1: Pre-Conventional

Stage 1: Obedience (How can I avoid punishment?)

Stage 2: Purposeful exchange (What's in it for me?)

Level 2: Conventional

Stage 3: Being a nice person (Abiding by social norms)

Stage 4: Law and order morality (Abiding by the laws of the day)

Level 3: Post-Conventional

Stage 5: Societal consensus (Abiding by the standards of democratic society)

Stage 6: Universal moral principles (May override the laws/standards of society).

(Vesilind & Gunn, 1998a: 20-23)

<sup>127</sup> Jean Piaget presents a similar tiered developmental theory. (See Mussen, et al., 1963: 38-41, 309-314.)

<sup>128</sup> Vesilind & Gunn, based on the work of McCuen, suggest six categories of professional engineering morality.

Level 1: Preprofessional

Stage 1: Gain for the individual

Stage 2: Motivated by self-advancement

Level 2: Professional

Stage 3: Loyalty to the firm

Stage 4: Loyalty to the profession

Level 3: Principled Professional

Stage 5: Service to human welfare is paramount

Stage 6: Follows universal rules of justice, fairness, and caring for others.

(Vesilind & Gunn, 1998a: 24-25)

Having shown *how* human beings come to be aware of a fundamental moral good, it is now apposite to attempt an articulation of *what* the fundamental moral actually is.

#### 4.2.3 Proposition C: The fundamental good – beneficence

It will be instructive in opening the discussion in this sub-section, to return to what has been a focal point in this study thus far, that is the basic ethical question, “What is the proper way to act towards the environment?” This question, as has been said, emerges at the interface between human beings and the environment, and previous discussions investigated the assumptions subsumed in the terms *act* and *environment*. Moving on, more clarity is now being sought about the term *proper*. According to Thompson, “An action is judged ‘right’ or ‘wrong’ depending upon whether or not it is a ‘good’ or ‘bad’ thing to do” (2006: 36), and in this context then ‘proper’, ‘right’ and ‘good’ are synonymous, as are ‘improper’, ‘wrong’ and ‘bad’. Thus one can say that the proper, or the right, or the good (adjective) way to act towards the environment (broadly defined) is to follow the way that enhances the good (noun) of the environment. It is a basic task of (environmental) ethics to define this *good*, and that is what the focus of this sub-section will be.

Having in the previous sub-section described how humans develop a sense of the moral good, the next step is to now elaborate further on the moral good itself. Bearing in mind that the environment is here broadly interpreted, and that the good therefore needs to be widely recognised, the spotlight will fall on the most basic good to emerge from human moral experience, and which is so widely manifested that one is constrained to accept that it is rooted in our evolutionary heritage. Reference has already been made to such common moral traits as “[f]air-mindedness, self-respect, respect for others, compassion, and benevolence” (Harris, *et al.*, 2000: 33). Here these traits are incorporated into a basic good, identified as *the* basic good, that of *beneficence*. Beneficence is defined as “active goodness, kindness”,<sup>129</sup> and it is closely related to the concept of *altruism*. Altruism is a “regard for others as a principle of action”,<sup>130</sup>

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<sup>129</sup> New Imperial Reference Dictionary. London: George Newnes Limited.

<sup>130</sup> *Reader's Digest Oxford Complete Wordfinder*, 1993. London: Reader's Digest Association Limited.

and it seeks to bestow beneficence on others in an unselfish way.<sup>131</sup>

According to Shermer (2004: 25-26) it appears, given the evolutionary nature of ethics, that the most common and enduring moral guideline to have evolved thus far is the so-called Golden Rule. (See also Hauser, 2008: 387-388.) This is the injunction to do unto others as we would have them do unto us, and it appears in various forms in many cultures and religions. As an example consider the teaching of Confucius who lived during 551-479 BCE.

The central concept of Confucius's philosophy is *ren*, meaning benevolence. (The word *ren* also means 'gentleman' in the sense of someone who behaves with authentic respect and consideration for others; the two senses are intimately connected.) The cultivation of benevolence does not only mean acting rightly, justly and compassionately towards others, but ensures that one will oneself avoid being arrogant, unjust, ingratiating or tyrannical. There is a form of the Golden Rule implicit in this ... (Grayling, 2011: 205-206)

It may be noted that there are other, less stringent (than the version given here above) formulations of the Golden Rule, such as for example "that we *ought* to act towards others as they *ought* to act towards us", or the even less demanding injunction to "*not* treat others as we would *not* have them treat us" (Olen & Barry, 1996: 9). Thus in general we might say that the "essence" of this moral rule at its highest level is to actively seek the beneficence of others, or at the lowest level, that the unbridled expression of our natural instinct of self-interest<sup>132</sup> is curtailed in favour of other-interest. It may be argued that the action of being beneficent to others evolved over time from the benefits that appeared to accrue from reciprocal altruistic actions between individuals or groups. However, beneficence or altruism, as used here, implies much more than simple reciprocity. For example there are many instances where, for different reasons, reciprocity is not possible,<sup>133</sup> yet some individuals still choose to act altruistically. In these circumstances the notion of beneficence acquires the status of an ethical principle, instead of being a simple tit-for-tat rule. Because beneficence, as described here, cannot easily be

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<sup>131</sup> Generally we understand *altruism* to mean the goodwill extended towards other *human beings*, but *beneficence*, as used here, is a broader term that could even include consideration of the best interests of non-human organisms.

<sup>132</sup> It is taken that the self interest evident in the 'survival of the fittest' evolutionary principle, is a primary human motive and instinct.

<sup>133</sup> For example, when donating money to the victims of catastrophic earthquakes in far-off countries, there is no possibility, or expectation of a reciprocal response.

rationaly justified (i.e. we cannot say why we should be beneficent, we just intuitively feel that we should) it assumes axiomatic value. We simply feel that we *ought* to be beneficent and altruistic because it is the good and the right thing to do. Based on the arguments made here above, we may consider beneficence to be not only an axiomatic value but also an evolutionary value, that is to say a value that has its roots in our evolutionary history, and therefore is common to humanity.<sup>134</sup>

If we say that this basic good is deduced from our common moral experience, it is not meant to imply that human beings act altruistically intuitively, but rather that very few, if any, 'normal' persons would claim that an act of altruism is immoral. In other words the principle of beneficence is so basic, that it does not seem possible to imagine a situation where behaving altruistically might be in and of itself the wrong thing to do.<sup>135</sup> Quite evidently however, there are many instances where human beings choose to act non-altruistically, not uncommonly where they choose to act in their own self-interest, where self-interest in itself is another very strong, and possibly the most dominant, evolutionary instinct. But even when we do not act with beneficence towards others, it is still something that we feel that we *ought* to do.

Accepting beneficence then as the basic, axiomatic good one would be surprised if it is found that any of the established ethical theories contradict it in principle. And so, it is argued here that ethical theories, such as the deontological and the utilitarian traditions, each in their own way, attempt to *promote*, *operationalise* and *optimise* the principle of beneficence. Differences, such as there may be between the various ethical theories, are not reflective of disagreement about the principle of beneficence, but more likely about what would be the most appropriate way in which to apply this principle. Furthermore the moral contradictions which may arise from the strict application of the dictums of the traditional theories (such as, for example, in cases where the application of a principle of a theory actually leads to individuals suffering loss) are precisely contradictions because they run counter to the intuitive demands of

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<sup>134</sup> Harris, *et al.* suggest that the moral disposition of humans arises from our vulnerability to pain and unhappiness, our autonomous decision-making potential, our interdependency on others and our shared expectations and goals (2000: 32-33). But are these predispositions to morality not themselves, to some degree, rooted in our evolutionary history?

<sup>135</sup> What is meant here is that it is hard to imagine an altruistic *intention* to be morally wrong. Of course there may be acts with an altruistic intention, which for various reasons, do not result in beneficence.

beneficence. One could thus argue that the principle of beneficence must be more basic than the principles of the traditional ethical theories, and that as such it serves as a foundation for these theories.

To conclude, the apparent universal acceptance of *beneficence*, as evidenced through the widespread articulation of the Golden Rule,<sup>136</sup> and its congruence with the major ethical theories, not only validate its position as *the* basic good, but also suggest that it is rooted in evolutionary altruism.<sup>137</sup> It also appears that there are no other distinct ethical values that enjoy the same level of acceptance. Hence, one could conclude that beneficence must be the most suitable ethical founding for sustainable development activities.

#### **4.2.4 Proposition D: Holism, the biocentric principle, fairness and moral distance inform the application of beneficence**

Two further issues around the application of beneficence still need to be addressed. As beneficence is directed towards *others*, the first question is who these others might be, and then, secondly, what the appropriate level of beneficence (to be accorded to these others) would be. These two questions are not mutually exclusive. It would appear, from experience, that the level of beneficence accorded would, to some degree, depend on who the others are. Furthermore, as a broad generalisation, it also appears that these two issues could be quite intractable, being, as they often are, points of disagreement between ethical theorists.<sup>138</sup> If, as has been suggested, it is unlikely that most will argue against the idea of beneficence or altruism being extended to others as being a fundamental tenet of ethics, it seems that there is considerable scope for disagreement when it comes to determining who the significant others are, or what level of beneficence should be accorded to them. These problems are particularly pertinent for those

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<sup>136</sup> Included here might also be other human traits claimed to be universal, for example fair-mindedness, respect for others and compassion.

<sup>137</sup> It might be claimed that positing beneficence as the fundamental good is somewhat trite, as it does little to address the traditionally difficult issues in the field of ethics, e.g. such as deciding between competing ethical claims for beneficence. It does however, as a guiding principle, set a goal that is simple and which enjoys near-universal appeal, and as such can hopefully not only guide ethical debate but also unite the debaters.

<sup>138</sup> For example, ethical theorists debate intensely whether or not animals in general, or specific classes of animals in particular, should enjoy moral considerability.

environmental practitioners who have accepted the all inclusive definition of the environment,<sup>139</sup> and as a consequence have broadened, considerably and vexatiously, the scope of who the significant others might be. Traditionally it has been taken for granted that the recipients of altruism will in general be other *people*. But given even this restriction, it remains evident, from experience, that some people merit or receive more altruism than others. For example, it is clear that in practice we show more altruism towards our kin than to others to whom we are not related. It also feels right that it should be so.<sup>140</sup> Physical proximity also plays a role – those close by receive more benefit from our altruism than those, say in distant countries. People in certain social classes also seem to merit more or less altruism than those in other classes. For example, as has been mentioned, it has only been comparatively recently, that slaves have been allowed to shed their lowly status, and as a consequence have qualified for greater levels of altruism. In more recent times too, black persons (in traditionally racist societies) and women (in traditionally patriarchal societies) have gradually been drawn into the circle of beneficence, and while presently there is much debate about the position of homosexual persons, it does seem that society in general is also moving towards greater levels of inclusion (and hence beneficence) for them as well. And while it thus appears, in Western societies at least, that some of these social strictures are weakening and that the boundaries of ethical inclusion are being expanded, modern environmental thinking is now also requiring that ethical consideration be given to non-human, and even the non-living members of the environment as well. Aldo Leopold speaks broadly of our “obligations to land” (1970: 245), and Holmes Rolston III argues for the inclusion of species and ecosystems (1998: 71-86).<sup>141</sup> While amongst environmental ethicists the position of non-human animals (to some degree) and non-living components of the environment (to a larger degree) are still unresolved debates, there certainly seems to be, in line with the idea of an evolving ethical progression, increasing pressure towards the inclusion of more and more elements of the natural environment. It is thus not unrealistic to believe that, even in our times, animals (at least) will be experiencing increasing levels of beneficence at the hands of humans.

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<sup>139</sup> See Chapter 1, §1.2.3.

<sup>140</sup> This intuition probably reflects back to our evolutionary heritage.

<sup>141</sup> Refer also to §3.1.3.

This trend of broadening ethical concern<sup>142</sup> points to a further principle that this study will endorse as a fundamental principle – this is the principle of *holism*.<sup>143</sup> Unlike the principle of beneficence, it cannot be claimed that holism is a widely accepted principle, or that it necessarily has roots in our evolutionary history. Nevertheless it may be argued, with some justification, that the manifestation of this principle with respect to the natural environment was more in evidence in indigenous, primitive societies, as these societies had a far closer and more organic relationship with the natural environment than modern societies have. It can then be argued further that it is a Western mind-set, born in Cartesian dualism and shaped by scientific reductionism, that has severed our ties with nature. Many environmental thinkers see most of our environmental problems rooted in this rupture, and consequently call for its healing as a necessary requirement to overcome the environmental dissonance that we face. Fox identified this approach as “the *central* intuition of deep ecology”, and he then continues as follows:

This is the idea that there is no firm ontological divide in the field of existence. In other words, the world is simply not divided up into independently existing subjects and objects, nor is there any bifurcation in reality between the human and non-human realms. Rather all entities are constituted by their relationships. To the extent that we perceive boundaries we fall short of a deep ecological consciousness. (Fox, 2003: 255)

Sterling speaks of an *ecological* world-view, which

... recognizes that we are connected to the rest of nature both materially and spiritually far more intimately than the conventional world view permits us to acknowledge. (1990: 83)

Sterling goes to some length in comparing the conventional world-view, which he calls the mechanistic/Cartesian world-view, with the ecological world-view. His summary of this comparison is reproduced in Appendix D. In Sterling’s view this

... ecological world view, based upon a rising tide of thinking and practice that can be called systemic or holistic, is the only genuine hope for a sustainable future for humankind and the Earth. (1990: 77)

Thus, as can be seen in Appendix D, Sterling equates the ecological world-view with a holistic

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<sup>142</sup> One can see the notion of broadening ethical concern mirrored in the broad, inclusive interpretation that can be put on the term environment, as was discussed in Chapter 1.

<sup>143</sup> This principle, in the context of sustainable development, will be referred to, and dealt with more extensively in the following chapters.

world-view.

Fox's and Sterling's views are echoed in Aldo Leopold's notion of a *land ethic*.

The land ethic simply enlarges the boundary of the community to include soils, water, plants, and animals, or collectively the land. ... In short a land ethic changes the role of *Homo sapiens* from conqueror of the land-community to plain member and citizen of it. (Leopold: 1970: 239, 240)

And Callicott confirms that it is the

... holism of the land ethic, more than any other feature that sets it apart from the predominate paradigm of modern moral philosophy. ... [In short] it is holistic with a vengeance. (1995: 155)

Given the above one must conclude that if sustainable development is to be successful as a strategy for addressing the multi-faceted environmental challenges that confront us, it can only do so by adopting the principle of holism, even if the realisation of this principle in practice is not always easy. (The world-view comparisons reproduced in Appendix D can be of some value in attempting to express the holistic principle in practice.) For the moment, it will suffice to reaffirm that this study concurs with the above mentioned thinkers (and others) that holism needs to be a fundamental aspect of sustainability theory and practice, and hence concludes that no element of the environment, broadly conceived, is beyond the scope of sustainability considerations, and that one's approach should be inclusive rather than exclusive. This implies then that in the practical application of beneficence, all persons, including disadvantaged and distant peoples, present and future generations, and also non-human organisms, need to be taken into account. The position of non-living elements of the environment requires some further thought.

It will be argued in this study that the boundary of moral considerability is demarcated by the criterion of *life*. This criterion has been called the *biocentric* principle, and it, by implication suggests a slightly narrower view as what some theorists would claim is warranted by the principle of holism. Obviously then this adoption of the biocentric stance needs to be defended, particularly if it is seen to represent, in some measure, a contraction of the principle of holism. It will be argued in what follows that this apparent contradiction is of little consequence, and that the principle of holism still remains a cornerstone of sustainable development; a view that

is championed throughout this study. In order to justify the endorsement of the biocentric principle in this study, it is necessary to deviate momentarily from the general line of argument in this sub-section, and to briefly return to the issue of instrumental values versus intrinsic values.

In re-opening the instrumental/intrinsic value debate, it needs to be stated that, for the purposes of this study, values irrespective of what type they may be, are understood to necessarily imply *valuers*. This means that values do not exist as independent entities, but that they, in effect, reflect the views or dispositions held by a valuer with respect to certain material or immaterial objects. In other words the value of any object is inextricably related to a valuer. Hence one can also explain why a given object could be valued variously, as it could simply be that different valuers, each from their own perspective, place a different degree of value on it. An item sold at an auction clearly demonstrates this relationship between the item and various valuers (bidders). While the price of the item is low there may be many bidders that would value it at that price, but as the bidding increases there are progressively fewer bidders, until it is eventually sold at the price which represents the value it holds for only one of the bidders. This example not only demonstrates the different levels of value that valuers might accord to an object, but also the fact that values do not exist independently of valuers.

Given this intimate relationship between values and valuers, an instrumental value may be defined as the value that a valuer places on an object external to the valuer. Instrumental values are often construed as use values, implying that the instrumental value of the external object lies in the use that it has for a valuer. This interpretation applies readily to tangible objects, but for intangible objects the term 'use' may need to be more broadly interpreted, so that it equates to 'meeting a need'. Thus, for example, it can be argued that one's experience of the value of a beautiful sunset, is instrumental in that it meets one's need for aesthetic satisfaction. Intrinsic values, in contrast to instrumental values, are inwardly directed. The intrinsic value of an entity is often said to be the value it has in and of itself. A person's intrinsic value is the value that inheres in that particular person's personhood. My intrinsic value is the value that I have for myself, and it comes about because of my inborn self-interest. I have no reason to believe that other persons will not, in similar fashion as I do, also experience their own intrinsic value, again inwardly directed to themselves.

Because all values, be they instrumental or intrinsic, are framed from the perspective of the valuer, they cannot be directly experienced by another valuer (in much the same way as another person can have no direct access to my thoughts). In this sense it can be said that values are private, and another person cannot know my values unless they are communicated to him or her verbally or through my actions. The example of the bidders at an auction is a case where other persons get to know how much I value an item through the bids that I make. Instrumental values are more readily communicable as they can often be expressed in a common currency, monetary or otherwise. However intrinsic values have no currency in which they can be measured, let alone a common currency. The most we can say about the assessment of intrinsic values, judging by the way we feel about our own intrinsic value, is that they are normally assessed very highly. Furthermore, I can only be aware of the intrinsic value of others because, as I know that I have intrinsic value for myself, I assume that the same applies to them.

While intrinsic values and instrumental values are different in nature, the former being inwardly directed and the latter outwardly, they are nevertheless, in another sense, quite closely related. It may be argued that instrumental values only make sense to the valuer when they can, in some way, be tied back to the intrinsic value of the valuer. It is hard to imagine that any object can have instrumental value for me if it does not enhance my intrinsic value. For example, a pen has instrumental value for me as a writing instrument, and this is so because in the final instance it adds to my intrinsic value as a writer, but for an illiterate person a pen may hold no such value, it may in fact detract from his intrinsic value as it brings to the fore his inability to write. And so we may conclude that the value of an object outside of the valuer only has the status of an instrumental value if it in one way or another endorses the intrinsic value of the valuer. It may also be mentioned that while some instrumental values (such as the value of art) may require some level of rational ability, it is by no means a necessary requirement for all values, and particularly not so for intrinsic values.

A significant thread running through the reasoning thus far is the crucial role that valuers play in the establishment of values – without valuers there are no values in general, and no intrinsic values in particular. Intrinsic values exist primarily because valuers have an in-born self-interest, and instrumental values exist primarily because valuers have intrinsic value. The self-interest of the valuer is thus at the core of the intrinsic/instrumental value system as perceived

in this study. Furthermore it is axiomatic that in order to have a self-interest one must be alive; inanimate objects cannot have a self-interest. It defies the logic of our current knowledge to suggest that a stone, for example, could have a self-interest. To move a stone from A to B does not, as far as we know, make one iota of difference to the stone. However to move a living entity from A to B does make a difference to the entity; the difference may be trivial, but it could also be of great significance.

In terms of the basic ethical good identified in this study, it can be stated that in according beneficence to others one is, to use modern terminology, adding value. Others can only benefit from this ethical good if the ‘added value’ is meaningful to them, and this will be the case if they have a self-interest. In short, what is being contended here, is that it is only subjects of a life that have self-interest and intrinsic value, and that can experience added value, and as such can be subjects of moral consideration. To phrase it differently: *one needs to be alive to have intrinsic value, and one needs to have intrinsic value to be worthy of moral consideration.* Moral acts are acts that bestow beneficence on those others that have intrinsic value (that is to say those that have life), and this is achieved by enhancing that which is of instrumental value to those others, as this endorses their intrinsic value. An inanimate object has no self-interest or intrinsic value, and hence cannot directly be the subject of a moral action. However an inanimate object may be of instrumental value to an other, who is considered morally worthy, and by enhancing this instrumental value, I am behaving morally towards the said other. To sum up then, for the purposes of the moral model being proposed in this study, morality is in essence expressed through acts of beneficence targeted at others, where the others includes all those who are the subject of a life.<sup>144</sup>

To address more directly the perception that the application of the biocentric principle (beneficence is accorded only those who are alive) is in conflict with the principle of holism (beneficence is accorded to *all*), the following argument, the basis of which has already been laid, is put forward. It needs to be noted that the biocentric principle only excludes the inanimate from consideration as *primary* subjects of moral worthiness, but their role as *secondary* subjects of moral consideration remains in place. In other words, the non-living find

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<sup>144</sup> The phrase “subject of a life” simply means being alive, as opposed to the more restrictive definition provided by Regan (1998: 351).

their moral worthiness in the instrumental value that they have for those who have intrinsic value, that is the living. In this fashion one can argue, for example, that the damage which may be done to a certain ecosystem (inanimate entity) is immoral, not because of the harm caused to the ecosystem itself, but because of the harm (negative beneficence) perpetrated against the organisms (the living entities) that are part of that ecosystem. By the same token, if I preserve an ecosystem, I am enhancing what is of instrumental value of those organisms that live in the ecosystem, and in that I am performing a moral act.<sup>145</sup>

Even if some might consider the above argument still too thin to resolve the conflict between the biocentric principle and the holism principle, then one could argue further that the inclusivity demanded by the holism principle does not necessarily demand equal treatment of all. Certainly by upholding the principle of holism we are trying to set new norms of inclusivity that could counter, in particular, the anthropocentric based exclusivity of the past, but to suggest that by including all we should be giving *equal* treatment to all, is utterly quixotic in theory and downright impossible in practice. To think that the principle of holism demands that one should give equal moral consideration to, for example, a stone and a human being, is to demean the principle and to turn it into a farcical measure. Even when one limits moral consideration to living organisms (through application of the biocentric principle), it is abundantly clear that some organisms (flies, for example) warrant less moral consideration than do others (say, human beings). Thus, so the argument goes, even if the principle of holism demands the moral considerability of the non-living, the moral worth (intrinsic value) of a stone, for example, could be assessed so low compared to the moral worth of, say human beings, that it would practically not amount to much more (and maybe even less) than what it would have been, had the stone been valued instrumentally. It is thus concluded here that the holism and biocentric principles are not, in a pragmatic sense, contradictory, and that they can both be foundational for the ethical model here under construction.

The second of the two questions posed at the beginning of this sub-section, revolves around the issue of what the appropriate level of beneficence to be accorded to the others would be. The arguments used in the previous paragraph, hinting at differentiated levels of beneficence, also

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<sup>145</sup> In this way one can circumvent the need to ascribe direct moral worthiness to inanimate objects such as species and ecosystems, as Rolston (1998: 71-86) suggested.

prompt this question. Assuming then that agreement is reached on the assertion that beneficence is the foundation of the ethics of sustainable development, but sensing that not all the recipients of beneficence warrant equal levels thereof, the question then is how does one decide on the differentiated levels of beneficence?

Having found it logical for *all* living entities to be worthy of beneficence, one cannot perhaps but feel overwhelmed by this extremely wide ranging moral imperative. But as has previously been the case, our intuitive knowledge again provides some relief. It seems not only logically warranted, but also acceptable to accord variable, instead of equal, levels of beneficence to all those who are morally worthy (as identified through the biocentric principle). For example, as has been mentioned, our kin would probably merit more beneficence than strangers, and humans more than say insects. But admitting to various levels of beneficence being accorded, does not in itself answer the question as to *what* the levels should be. This question becomes even more vexing and even critical when the beneficence involves limited resources, as it seems, is increasingly becoming the case with environmental resources.<sup>146</sup> In such instances, allocating more of these limited resources to some of the beneficiaries, means that there are less available for the rest. It is plainly obvious that such a skewed distribution of beneficence will need some ethical justification. Again reasoning somewhat intuitively, it seems that in the case of limited resources, very few would argue against the suggestion that the scarce resources be allocated on the basis of *fairness*. Allocating limited resources fairly does allow for their unequal allocation if this can be justified in the circumstances. There appears to be no reason why the principle of fairness should not be a universal rule that applies to all cases where beneficence is bestowed. On the basis of its wide acceptance, it could be argued that the concept of fairness has also spread from its evolutionary roots (as was the case with beneficence) to a level (particularly in Western society) of near universal acceptance. It is difficult to imagine a situation in which it could reasonably be argued that the application of fairness would be unethical. Indeed a number of social institutions, such as for example, courts of law,<sup>147</sup> might claim as their *raison d'être* the need to adjudicate on the principle of fairness.

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<sup>146</sup> The competition resulting from scarce resources is a basic tenet of classical economics, but many environmentalists claim that the traditional economic solutions are unethical as they lead to the rich getting richer and the poor poorer, not to mention the fact that environmental goods are often wastefully treated as free goods.

<sup>147</sup> In South Africa other good examples might be the Human Rights Commission and the Commission for Gender Equality.

Hence, as with beneficence, the principle of fairness has become elevated to the position of a general axiom or a Kantian categorical imperative.

But even if beneficence is accorded fairly rather than equally, the practical question still remains: what are the variable levels at which beneficence should be accorded to be fair? The *equal* distribution of scarce resources is easy to implement practically, and it is fair when the merits of all recipients are considered to be equal. However quite often it is the case that some recipients are considered more merit worthy than others,<sup>148</sup> and then the fairness principle would require an unequal distribution of the resources, but how unequal is often not clear. Thus quite evidently, employing the principle of fairness, does not guarantee answers, and what then ensues is much debate on precisely what is fair. Some would argue that to quote fairness in these circumstances is at best simply trite and at worst fatuous. This study however accepts that practical difficulties in applying a principle need not compromise its theoretical validity. There seems to be little doubt that society accepts the principle of fairness and that it will use various means, such as arbitration or courts of law, to help it decide what is fair.<sup>149</sup>

In those problematic cases where the application of the fairness principle fails to pronounce unambiguously on the levels of beneficence to be accorded, one could perhaps advance some additional ideas implicit in the concept of fairness, in an attempt to procure more clarity. One such idea might be the notion that a fair allocation of beneficence should be done on the basis of *respect*. This implies that it would be fair to allocate more beneficence to those you respect more and less to those whom you respect less. Hence human beings would tend to accord more beneficence to say elephants, who enjoy more respect in society than say fleas, who consequently warrant less beneficence. Unfortunately the term respect does contain some in-built ambiguity in that it can also convey feelings of submissiveness or esteem, neither of which is the intention here. Rather, what is meant is a respect for the ethical worthiness of the other. This is in line with the so-called “Kantian respect” which is derived from Kant’s

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<sup>148</sup> For example it could be argued that it is fair to provide more resources from the public purse to the poor than to the rich (as is being done in South Africa).

<sup>149</sup> The Law itself may sometimes be used to prescribe what is fair, as for example the South African Law on affirmative action attempts to do.

categorical imperative: “Never use other people merely as a means to your own ends.”<sup>150</sup> (Olen & Barry, 1996: 9)

Another alternative, perhaps less equivocal, idea which may be used to render more clarity to the concept of fairness, is that of *dueness*. When one has (Kantian) respect towards others, one would be altruistic towards them to the degree that is their due. Dueness may be explained as

an ‘equal consideration of interests’ ... [which] does not mean that all have equal rights or should be treated equally, but that each should be treated in a way that is appropriate”. (Singer, as paraphrased by Thompson, 2006: 71)

When we behave fairly towards others *according to their due*, we can justify, if need be, an unequal allocation of beneficence. For example, our children, on the basis of their particular relationship to us as their parents, qualify (or are due) for more benefits from us than are other children not related to us, and society would in general regard such an unequal distribution as fair. Approached like this the principle of fairness does not require equality, but simply that each is accorded beneficence according to their due.

Of course the critic might argue that all of the above is simply a play on words, and that we are no nearer to solving the dilemma of according varying levels of beneficence, irrespective of whether we speak of fairness, respect or dueness. Unfortunately, at present, there appears to be no univocal solution to this dilemma, and thus while these concepts that have been put forward here, may help to shed more theoretical light on the issues, they do not necessarily provide clear-cut, practical answers. There simply appears to be no readily available algorithm that can solve these problems. While offering no universal canon, the pragmatist would attempt to assess the merits (respect or dueness) of each of the beneficence recipients in these problematic situations in the light of all the available information, and then to try and work out a solution that will be as fair as possible to all the parties concerned. As has already been intimated, society has established various social institutions for dealing with such cases of competing demands for beneficence, where the proposed solutions are contested. These include courts of law, commissions, tribunals, arbitrating or mediating bodies, etc., all of which are aimed at resolving such predicaments as fairly as possible.

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<sup>150</sup> Of course Kant’s respect was reserved only for human beings, whereas the context here requires a wider application of respect.

A final concept that may be put forward as a way in which fairness could be applied, maybe where the notions of respect and dueeness do not give sufficient direction, is the notion of *moral distance*. While there is no pretension that this new concept can provide exact answers, it does have a practical slant that facilitates understanding, and it also resonates comfortably with the moral model of Callicott, which will be discussed later. The idea is then that beneficence should be extended according to the moral distance between the giver and the recipient. In other words, those recipients who are morally more proximate are accorded more beneficence than those who are morally more remote. In its simplest interpretation the notion of moral distance overlaps with that of spatial distance. We tend, for example, to accord more beneficence to our own community than to other communities which are physically more remote, such as those in other countries.<sup>151</sup> More broadly however, moral distance would have a social interpretation, such as familial proximity, where those who have a closer kinship relationship with us would merit more of our beneficence. Another manifestation of moral distance would be in terms of cultural proximity, where one would be inclined to behave more altruistically towards those of one's own culture.<sup>152</sup> Another way in which moral distance could be expressed is that of generational proximity, where it would seem justifiable to exhibit more beneficence towards one's children than say to one's great-great-grandchildren. One could also think in terms of species proximity; here humans would tend to extend more beneficence to those species to whom they are more closely related. For example we would show more compassion towards a chimpanzee than say towards a moth.<sup>153</sup> Finally the concept of moral distance can also be applied to operationalise the biocentric principle in practical situations. We accept, it seems, as natural that our moral obligations to others diminish as these others become more remote from us on a bio-scale. We, for example, feel morally more obligated to animals than to plants. Also the moral obligations that we feel towards organisms such as protozoa and bacteria are

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<sup>151</sup> A millionaire businessman in South Africa has recently launched initiatives through which he aims to share some of his wealth with poor communities in the country. No objection has been raised against the fact that in this magnanimous gesture, the poor of, say India, go unacknowledged.

<sup>152</sup> Some would see the warning lights of cultural prejudice and even racism flickering as we move down this line of reasoning, but it nevertheless remains common to value our own culture more than other cultures, and cultural watchdogs actively encourage this attitude. On the other hand, our evolutionary ethical model does not exclude the possibility that cultural preferences and their associated ethical proclivities can change over time.

<sup>153</sup> Here again the charge of speciesism raises its head, but the concept of moral distance has some value in that it allows some ethical discrimination that is in accord with our intuitive heritage, without necessarily being dogmatically prescriptive.

so diluted as to be hardly distinguishable from the moral indifference that the biocentric principle imparts to non-living organisms. Thus the concept of moral distance is useful, at least qualitatively so, in describing the moral variance that seems to be an inevitable characteristic of our ethical sensitivities as we have inherited them, and as such is also reflected in the ethical model being proposed in this study.<sup>154</sup>

It might be useful to now consider two diagrams provided by Nash (1989: 5, 7), which, although used by him in the context of ethical extensionism, can be adapted here to further illuminate the concept of moral distance. In the first diagram, Figure 4.1, Nash shows how (in the historical context of Britain and the USA ) rights have been extended over time to various disadvantaged or minority groupings. For the purposes of this study this diagram can be taken to represent moral distance as it increases outwardly from a central point. One may conceive our evolutionary rooted self-interest to be at the centre, while the social classes depicted in the figure, reflect , at a given point in time, their moral distance from us, with nature being at the very extremity of our moral consideration.

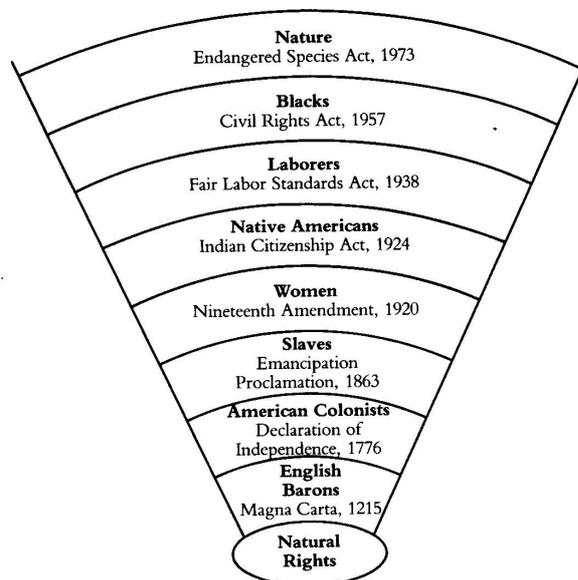


FIGURE 4.1: THE EXPANDING CONCEPT OF RIGHTS (Nash, 1989:5)

<sup>154</sup> It should be noted, at this point, that the uncritical use of the notion of moral distance in order to justify racial discrimination and cultural bias robs the notion of its beneficial use. Thus these dangers are addressed in more detail a little later in this section.

In the second diagram, Figure 4.2, Nash shows the evolutionary development over time of ethical consideration. However, from the point of view of this study, it also represents increasing moral distance, which starts with oneself at the centre and then increases progressively through one's family, other human beings, non-human organisms, non-living entities to eventually reach the universe at the extremity.<sup>155</sup> (As an aside it may also be noted that Nash, through this diagram, acknowledges the reality of ethical evolution.)

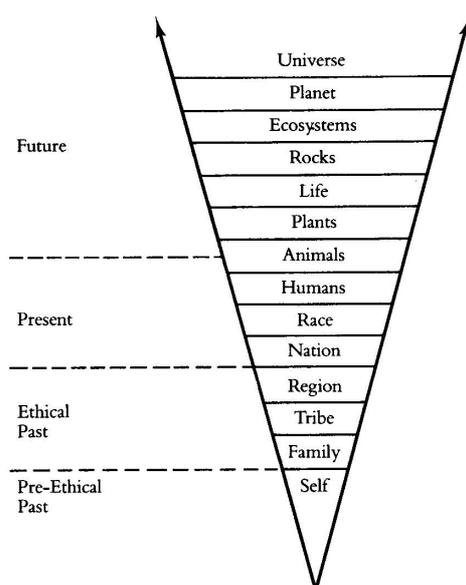


FIGURE 4.2: THE EVOLUTION OF ETHICS (Nash, 1989: 5)

On the left of the diagram in Figure 4.2 a time scale reflects the chronology of the extension of the sphere of moral considerability. It may be noted that the moral model put forward in this study has already, through the biocentric principle, advanced the “Present” boundary on this time scale so that it falls in the “Future” zone of the diagram, on the line separating the “Life” category from the “Rocks” category.<sup>156</sup> However the purpose of introducing the notion of moral distance here, is not so much to reflect on the extension of the sphere of moral considerability

<sup>155</sup> An implication that could be deduced from this diagram is that the biocentric principle may, in time, be superseded by an even more wide ranging ethic. However this is only a potential future possibility, and for the moment the biocentric principle remains intact as a cardinal premise of the ethical model being proposed in this study.

<sup>156</sup> It has already been argued at length that while the biocentric principle excludes the non-living components of the environment from moral consideration in their own right, entities such as rocks and ecosystems, can still through whatever instrumental value they may hold for other living organisms, receive moral consideration indirectly.

as such, but rather it is an attempt to interpret, on a slightly more rational and practical basis, rather than on an *ad hoc* basis, the variable apportionment of beneficence to those who are considered to be morally worthy, but maybe not equally so.

Both of the above diagrams also resonate with the idea that ethical values evolve progressively, as was suggested earlier, and so they can also be said to represent a temporal version of the concept moral distance.

The principles of holism and biocentrism are both moderated by the concept of moral distance. While holism dictates that all subjects within the universe, and biocentrism that all organisms within the community of life, are worthy of moral consideration and hence to be accorded beneficence, the idea of moral distance confirms that those that are more proximate morally are worthy of *higher* levels of beneficence. While it is evident from the literature that not all theorists would support the idea of moral distance (see *The Monist* of July, 2003), it is felt here that it reflects a reality that cannot be ignored. Some theorists would even go so far as to invert the moral distance by assuming that a bio-system, for example, has a higher moral standing than the individual, and hence, in Regan's words, raise "the clear prospect that the individual may be sacrificed for the greater biotic good" – a case of "environmental fascism" (1998: 358). The depiction of moral distance along the lines of Figure 4.2 ensures that Regan's fear does not materialise. Perhaps a broader objection to the notion of moral distance, and the unequal apportionment of beneficence warranted by it,<sup>157</sup> will be forthcoming from the human rights champions who insist that these rights should apply equally to all human beings. But it seems that society in general is more accepting of an unequal allocation of beneficence; who would condemn a poor parent who shares his or her meagre food supply with his own children, rather than with children of the community at large? Notwithstanding the spectre of xenophobia most citizens, it seems, would expect their government to use the resources at its disposal to the benefit of the local populace, rather than to the benefit of foreigners.

It needs to be understood that the concept of moral distance can be applied in two ways; firstly it can simply be used to *describe* the way in which the application of beneficence is

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<sup>157</sup> While moral distance may warrant the unequal apportionment of beneficence, it nevertheless is still deemed, on the basis of various considerations, to be fair.

encountered in society, and secondly it can be used to *justify* an unequal apportionment of beneficence. It is this second way in which the concept may be used that can be contentious, as was suggested the case might be when it comes to human rights. The first way of using the moral distance concept, the descriptive way, is non-controversial and needs no further elaboration here. The use of the concept of moral distance as a normative instrument can in some instances (when dealing with our kin) be less contentious, and in other instances (when dealing with strangers) it can be more contentious. An issue of the journal, *The Monist*, (July, 2003) was devoted to a discussion of the normative interpretation of moral distance. It can be said that the contributors were roughly divided between those who supported its normative use and others who did not, arguing that it implied a “callous indifference” to the needs of the morally remote. It is argued here, in line with evolutionary arguments that have already been used, that “humans are by nature unsuited to show equal concern to distant people and events compared to those near in time and place” (Chatterjee, 2003: 327). The wide-spread manifestation of the application of moral distance in our everyday dealings is evidence to this fact. To deny this reality will not, it is believed here, advance the cause of sustainability. Of course it must be remembered that if the resources of beneficence are available in abundance, the normative problem of moral distance is no longer an issue. However, when the resources of beneficence are in short supply, moral distance can be used in conjunction with other factors to make a differentiated apportionment of beneficence. The distinction between personal and public morality, to be discussed later, also plays a role here.

The moral proximity resulting from kinship is perhaps one of the applications of moral distance that is less contentious. It is based on hereditary traits that arise from our evolutionary history, and these are so much part of our psyche, that to counter them feels intuitively wrong. Singer reports on social experiments that attempted to break down familial bonds, and which in the long run were unsuccessful (1997: 112-113). He concludes that “in the case of parental care for children, ethics and biology are, at least to a degree, in harmony”,<sup>158</sup> and furthermore that “[o]bligations to help ... more distant kin ... seem to be proportionately weaker variants of the obligations of parents to support their children” (Singer, 1997: 113-114, 115). Thus there is little doubt, at least as far as kinship goes, that we live by the precepts of moral proximity, and

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<sup>158</sup> Singer recognises that familial ties, and in particular those of parents to their children, are often misused to meet the needs of the parent rather than that of the child (1997: 114).

that we feel, particularly in the case of close moral proximity, that it is morally right to do so. Very few people would have moral reservations about behaving more altruistically towards their own kin as opposed to others who are unrelated to them.

More problematic is the use of moral distance to justify the apportionment of more beneficence to those who are culturally more proximate to one, bearing in mind the equality prescribed by human rights. Is it right that we tend to be more charitable towards those of our own culture? It should be noted that in the unequal apportionment of beneficence cultural proximity is only one of a number of criteria that one may use. Dueness as expressed in need or circumstances, other forms of moral distance such as spatial proximity or linguistic proximity, and simply opportunity, are all factors that may come into play. Furthermore in the apportionment of beneficence one is trying to make a decision between courses of action all of which are moral, even if some are more so than others. Moral distance can never be used as a justification for immoral actions such as xenophobic persecution and racial abuse. One must nevertheless recognise the influence of culture on moral norms and find ways of dealing with the potential dangers of cultural bias and the more subtle cultural relativism. This will be the focus of the next sub-section.

Returning more specifically to the potential conflict between the notions of moral distance and human rights, some further insight may come from the distinction one can make between *personal* and *public* morality. By personal morality is meant the moral norms that are applied by individuals, while public morality refers to the norms that are applied by social institutions. Moral distance as it is used in personal morality is different from the way in which it is interpreted in public morality. For example, in one of the most common arenas for public morality, that is the national arena where the relationship between government and citizens is at issue, it is clear that moral proximity as it may be inferred through kinship plays no role here. Furthermore it could be argued that cultural proximity, particularly in multi-cultural countries, or in an international context, is of little significance, and hence that the moral distance between the government and the citizens should be the same for all the citizens, irrespective of what

culture they adhere to.<sup>159</sup> When understood like this, then there need be no tension between the notions of moral distance and human rights. This does not deny that moral distance in other forms still plays a role on the national stage. Moral distance in the form of national proximity is used by a government to justify the preferential treatment it accords to its own citizens as compared to those of another country. Foreigners can, for example, be restricted in terms of voting and land owning rights, and such actions are not, in general, deemed immoral. It is thus here confirmed that the notion of moral distance in both personal and public morality remains a useful device in assessing the apportionment of beneficence.

Before concluding this sub-section it is opportune to review Callicott's moral model (2003: 214-216) because of its close correlation with the model being proposed in this study. Callicott (2003: 214) claims, as the root of his moral theory, Leopold's "community concept",<sup>160</sup> which corresponds with the principle of holism, and in his further elaboration he not only supports the evolutionary foundation of human morals but also identifies beneficence (more by implication than explication) as the core moral value.<sup>161</sup> Leaning strongly on Darwin,<sup>162</sup> Callicott, describes our moral evolution as follows:

... the proto-moral sentiments of affection and sympathy (upon which David Hume and Adam Smith erected their moral philosophies) were naturally selected in mammals as a device to ensure reproductive success ... For those species in which larger and more complex social organisation lead to even greater reproductive success, the filial affections and sympathies spilled over to other family members – fathers, siblings, grandparents and grandchildren, uncles and aunts, nephews and nieces, cousins and so on. Human beings evolved from highly social primates in a complex social matrix, and inherited highly refined and tender social sentiments and sympathies. With the acquisition of the power of speech and some capacity for abstraction, our ancestors began to codify the kinds of behaviour concordant and discordant with the inherited communal-emotional bonds. They dubbed the former good and the latter evil. Ethics thus came into being. (2003: 215)

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<sup>159</sup> Of course this is not always the case as evidenced in the genocide that occurred in Rwanda, and in South Africa some would argue that the Government displays a clear preference for African culture, possibly at the expense of other cultures.

<sup>160</sup> According to Leopold, "A thing is right when it tends to preserve the integrity, stability and beauty of the biotic community. It is wrong when it tends otherwise." (1970: 262)

<sup>161</sup> Callicott speaks of "affection and sympathy" (2003: 215).

<sup>162</sup> Also from the work of Darwin, Nash concurs that "human beings broadened their ethical circle to include 'small tribes', then 'larger communities,' and eventually 'nations' and 'races.' ... Finally, humans would ... [develop a] 'disinterested love for all living creatures'." (1989: 44)

According to Callicott our moral evolution not only meant that our “ethical prescriptions and precepts grew more varied and complex”, but also that “the circle of morally enfranchised persons expanded apace” (2003: 215). Initially human ethical consideration only extended to members of one’s family and clan, which in ancient times represented the full extent of social aggregation. But as society evolved, ever larger social groupings were formed; human clans merged to form tribes which eventually evolved into larger groupings such as nations. As these larger groupings came into being, they also progressively entered into the arena of moral consideration, however not at the expense of the more ancient ethical bonds, but rather as additional accretions over and above the existing bonds. One can, in Callicott’s words:

... graphically represent the expansion of our moral sensibilities from narrower to wider circles, ... like the annular growth rings of a tree. In such a figure the inner rings remain visible and present and the outer are added on, each more remote from the center, from the moral heartwood. (2003: 216)

For Callicott this evolutionary moral expansion culminates in the inclusion of biotic communities as envisioned in Leopold’s land ethic. Importantly, however the inner “rings” of ethical considerability still represent, through their more ancient roots, stronger moral bonds than the later accretions. It should be quite evident now that Callicott’s model of nested social circles, with an outwardly decreasing strength of moral obligation, correlates closely with the notion of moral distance introduced earlier.

It may be now noted that the above quotations are taken from an essay written by Callicott with the express purpose of repudiating moral pluralism.<sup>163</sup> This study, while in agreement with most of Callicott’s model, will nevertheless be in partial, but significant, dissent with respect to his outright rejection of pluralism. While it is evident that Callicott’s rejection of pluralism is on the meta-physical level, he objects so strongly that he apparently makes no allowance for pluralism even on a pragmatic level. The justification for favouring a pluralistic pragmatism in this study is to be found particularly in situations where one has to deal with competing moral claims. These moral claims may be obligated to claimants who do or do not enjoy the same moral standing (or proximity). Assuming that all citizens enjoy the same (public) moral standing, one may, for example, have to adjudicate between a convicted murderer’s right to life,

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<sup>163</sup> The title of the piece is: “The Case against Moral Pluralism”.

and that of the affected community which wants to preserve the right to life of its members by means of the deterrent value of capital punishment. The ongoing debate around capital punishment reflects the reality of this dilemma. But if in this example the moral claimants have equal moral standing, the problem is complicated even further if the claimants do not have the same moral standing, as may be possible in the constructs of both the model being proposed in this study and that put forward by Callicott. Callicott, for example, bases his theory on “a multiplicity of hierarchically ordered and variously ‘textured’ moral relationships”, where the hierarchical order refers to the “nested social circles” which can, as he suggested, be represented by annular tree rings, with those closer to the centre representing higher moral standings. When moral claims arise from different “social circles”, one may argue (in theory) that membership of an inner social circle warrants higher moral consideration than that of an outer circle, but in practical terms the process of “circle” adjudication (who belongs to what circle), and the relative levels of moral worthiness associated with each “circle” still remain unclear. In short the problem is (using the nomenclature of this study) one of *how* to adjudicate differing levels of beneficence according to moral distance, while not forgetting that the determination of moral distance can in itself be an intractable problem. While neither Callicott’s model nor the ethical model being proposed in this study are clear on how to resolve these types of problems, it is suggested here, notwithstanding Callicott’s aversion to pluralism, that a pluralistic approach, pragmatically applied, is the most productive way to move forward.

In conclusion it can be said that the moral model put forward in this study can satisfy Callicott’s monistic yearning for a master principle by proclaiming beneficence as its *summum bonum*, while the subsidiary principles of fairness (in particular), holism and moral distance also have monistic appeal. But in practice, the holism which renders all morally worthy,<sup>164</sup> and the fairness which prescribes that beneficence be imparted to the morally worthy in accordance with their moral distance can lead to great difficulties. Moral proximity (an inflection of moral distance), when at its highest in close family relationships, does not seem to be too problematical, but when moral distance increases, and its expression becomes more amorphous and subject to cultural definition, the problems increase apace – cultural relativism now enters the fray. Other problems that lurk on the fringes of the interpretations placed upon moral

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<sup>164</sup> Or only all the living if the biocentric principle is brought into play.

distance include xenophobia, racism and speciesism. In this study it is suggested that the best way of dealing with these problems is through pluralistic pragmatism.<sup>165</sup> In the next sub-section justifications for this suggestion are put forward.

#### **4.2.5 Proposition E: Pluralistic pragmatism moderates cultural norms and proclivities**

As has been stated, the moral model being proposed in this study is rooted in universal moral intuitions,<sup>166</sup> which are shared by all humans by virtue of their common evolutionary ancestry. Superimposed on this foundation there is a vast array of cultural norms and proclivities, some of which are becoming increasingly universalised, particularly in developed countries, through *inter alia*, the agency of the modern media. Having said that, it must be recognised that cultural norms residing in a particular parent culture, will reflect differences compared to the norms of other cultures. These differences can be attributed to the distinct ways in which the various cultures have evolved.<sup>167</sup> In multi-cultural societies, these differences are obvious sources of disagreement and even conflict. An effective moral model should be able to deal with such conflict. The solution being put forward in this study, that which is offered by the pluralism of moral pragmatism, recognises, in the face of many potentially conflicting cultural norms, that none are *per definition* better than the others. At the same time this approach does not gainsay the fact that some may be preferred to others because, when assessed against the basic ethical norms derived from our evolutionary history they fare better, or otherwise because they simply are assessed to be more effective in practice. These assessments would involve an analysis of the intentions and results of the cultural norms in question, when put into practice. While in some instances these assessments, when positive, may indicate the way forward even if not resolving the cultural discord, in other instances they may not, in which case one may simply have to concede that the pluralistic stance which accepts the *co-existence* of different cultural norms as the only pragmatic option.

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<sup>165</sup> It needs to be reiterated that relativism and pluralism are not synonymous. Relativism does not proclaim that some cultural norms are better than others, while pluralism may. Pragmatism also adds an experiential component that is willing to settle for what 'works in practice'.

<sup>166</sup> This may also be read as moral dispositions. (See Harris, *et al.*, 2000: 32-33.)

<sup>167</sup> For example, some cultures might favour polygamy over monogamy.

The moral values in the ethical model being proposed in this thesis can be (*à la* Callicott's model with its tree rings analogy) represented diagrammatically by a series of concentric rings, with the influence of cultural relativity on these values increasing in the outwards direction. At the centre of the concentric rings are those values which are subject to very little cultural influence, that is to say the values which spring mainly from our evolutionary background, are largely intuitive and near universal. Thus one would expect to find circles representing the values of beneficence and fairness at the centre, while cultural norms will be represented by the outer rings. As the cultural relativity of the values increases outwards, so the moral authority of the values *decrease*. In Callicott's words, the "duties correlative to the inner social circles to which we belong eclipse those correlative to the rings further from the heartwood when conflicts arise" (1989: 93-94).<sup>168</sup> This modelling of morality as a series of concentric rings is depicted graphically in Figure 4.3.

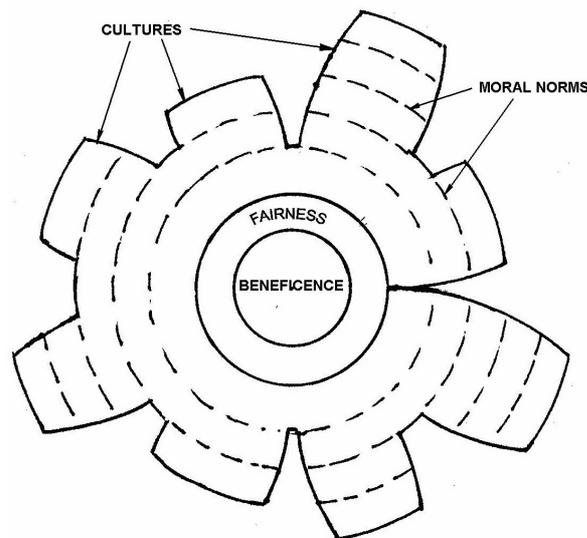


FIGURE 4.3: A DEPICTION OF VALUES IN THE PROPOSED ETHICAL MODEL

As has been said, the values depicted in the centre of the diagram are universal core values, while the cultural values which appear on the periphery may or may not be shared by various societies, and some societies may have more of such values and other societies less. It is insightful that the core values (depicted at the centre) of the proposed ethical model have monistic standing, whereas the cultural values on the periphery have to be understood

<sup>168</sup> While in this quotation Callicott was referring to his own theory, his words are also applicable to Figure 4.3.

pluralistically. In other words the values at the centre have the highest moral authority, but the further values are located from the centre the weaker their moral strength becomes. This understanding, as a supplement to the concept of moral distance, can be useful in trying to understand and resolve conflict between contradictory cultural values.

Of course ethical differences could also reside on levels other than that of culture. On a theoretical level there is the problem of the bipolar arguments that often feature in ethical debate; for example anthropocentrism is pitted against non-anthropocentrism, the intrinsic value of nature is set up against its instrumental value, pluralism challenges monism, and homocentrism opposes ecocentrism. And when it comes to the traditional ethical theories themselves, one may find the prescripts of say deontology framed as alternatives to those of say utilitarianism. (See Brody, 1983.) Consequently the impression may be created that we are faced with binary choices, having to choose one of the two opposing positions. However the reality is that these opposite positions essentially reflect stances adopted in philosophical debate, and that in practice their manifestation is much more ambiguous. These opposing positions may be seen as the opposite ends of value spectrums that are used by philosophers to characterise a coherent theoretical value stance, but in practice most of us (including philosophers one suspects) often adopt a more pragmatic and pluralistic approach.<sup>169</sup> It seems that from situation to situation and from time to time individuals and organisations may adopt positions that alternate between the opposing theoretical stances, without them even being aware of that fact. Thus in one situation we may tend more towards, say, a deontological stance and at another occasion more towards a utilitarian position. We may for instance favour a deontological approach of rigid non-interference with respect to pristine natural areas, while generally espousing utilitarian policies with respect to elephant management. In another instance our position towards animals may lean towards an intrinsic valuation such as in our dealings with our pets, but when dealing with cattle it may lean more towards an instrumental valuation when we see them as a source of protein. It might also be argued that, being human, we cannot but help being anthropocentric in our views, but we do at times deliberately try to be more non-anthropocentric, such as when we promote animal rights. These illustrations demonstrate that the consistent adherence to a particular theoretical position is not the rule, and

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<sup>169</sup> Many people, not being ethicists, are not even aware of the various ethical theories, and follow a mix of ethical practices that are based on cultural norms and intuition.

that we mostly follow our cultural or intuitive inclinations that lead to a rather more pluralistic approach. In the bipolar value debates the man in the street, probably unintentionally, adopts on the bipolar value spectrum, some amorphous middle position. One might expect that the engineers also tend to adopt their ethical stances somewhat intuitively, or according to cultural predispositions, without much awareness of the classical ethical positions that the various ethical theories may prescribe. While this unstructured approach to ethical decision-making is not what this study is promoting, it does seem that a purposeful, but yet pragmatic and pluralistic approach to the ethical justifications of sustainable development actions will not only be able to address conflicts in cultural values, but also possible value clashes that may emerge in the multi-disciplinary strategies of sustainability practice.

In spite of what has been said here above, which may imply that one's position on an ethical value spectrum is not fundamental,<sup>170</sup> it must be stressed that it is not necessarily immaterial. There are certainly some positions which are more conducive to environmentally sensitive practice, or which are more in line with sustainability, than others. One such case might be the holistic/reductionist value spectrum. It is evident that many environmental theorists are of the opinion that the reductionist view, so typically part of the world-view of scientists and technologists, is seriously inadequate in environmental thinking, and that the holistic view is a much better option.<sup>171</sup> Holism affirms that "the world is more than the sum of its parts" (Davies, 1992: 182). The environment, or nature, is a complex whole, which cannot simply be described or treated as the aggregate of its components. As it has already earlier been concluded that holism is a fundamental ethical principle upon which sustainability practice should be based, this is a case in point where, in this study, one of the antipodal positions on a particular value spectrum, is unequivocally favoured.<sup>172</sup> Given that environmental practitioners often have to deal with systems which are not only complex in themselves, but which by their nature also

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<sup>170</sup> A pragmatist may argue that it is not our ethical value position that is crucial, but rather the environmental outcomes that flow from it, and that good outcomes, or the same (good) outcome, might flow from different ethical stances. This view is in alignment with Bryan Norton's "convergence hypothesis" (1994: 240-243).

<sup>171</sup> It needs perhaps to be noted that some of the disciplines, that are usually represented in multi-disciplinary environmental assessment teams, are traditionally more inclined towards reductionism – disciplines such as engineering and environmental science. The use of specialists in environmental assessment may in itself be a reductionist problem.

<sup>172</sup> Notwithstanding this sentiment it must also be said reductionism is an almost inevitable methodological bedfellow of any of the natural or physical sciences involved in sustainability assessments.

require multi-disciplinary solutions, a holistic approach is imperative – but then within a framework of environmental pragmatism, as has been previously discussed.

In summary, the final conclusion arrived at here is, that if the ethical foundation and practice of sustainable development is to be justifiable on a broad front, it will need to employ a *pluralistic pragmatism* to accommodate both the variability evident in the moral and cultural norms of society, and the multi-disciplinary approaches that sustainability practice requires.

### 4.3 OUTLINE OF AN ETHICAL MODEL FOR SUSTAINABLE DEVELOPMENT

The point of departure for this study was found in the tension that exists between development initiatives and environmental concerns. This tension leads to problems many of which are very serious and wide ranging (e.g. global warming). It thus stands to reason that these problems have to be addressed through a strategy that is equally wide ranging in its ambit and popular support. The concept of sustainable development (without much competition) matches these requirements admirably, notwithstanding its own problems of vagueness and measurability. These problems are not inconsequential and they need to be addressed. This can be done in two ways. Firstly, the ethical foundations of the concept of sustainable development need to be clarified, so that unethical interpretations of the concept can be identified and discredited. Secondly, the concept of sustainable development, itself, needs to be subjected to a rigorous and deep analysis so that its “essence” can be uncovered, in order to inform the practices that flow from it. The first of these two tasks has hopefully been accomplished in this chapter. The second will be the theme of the following chapters (Section B).

In conclusion then, the ethical model developed in this chapter, as an ethical foundation for sustainable development, is summarised here below. It consists of the following prescriptions:

- Human *actions* impacting on the environment should be morally acceptable.
- The environment is interpreted broadly (principle of *holism*).
- Moral acceptability is judged through the *intentions* of the actors (humans) and the *results*

on the recipient (the environment).

- Moral acceptability is based on *beneficence*, a basic moral value which is near universal, being rooted in our evolutionary history.
- Beneficence is accorded to the morally worthy on the basis of *fairness, respect, dueeness* and *moral distance*.
- The morally worthy are all the living entities (present and future) in the environment (*biocentric* principle and the *holism* principle again).
- Beneficence means enhancing the *intrinsic value* of living entities through whatever is of *instrumental value* to them.
- Cultural values are recognised and critically moderated on the basis of *pluralistic pragmatism*.

It is proposed here that these prescriptions can serve as an ethical basis to inform the theory and practice of sustainable development.

## SECTION B

### SUSTAINABLE DEVELOPMENT

The ecological imperative is clear and cruel: nature must be saved or we humans will die. (Goulet, 1990: 36)

The most pressing need is for the emergence, clarification, and adoption of a new ecological world view that can create a sustainable culture capable of treating the Earth with gentleness and respect. (Sterling, 1990: 77)

We have tried to show how human survival and well-being could depend on success in elevating sustainable development to a global ethic. (WCED, 1987: 308)

The road travelled thus far started at the so-called environmental dilemma, a phrase used to characterise the tensions that exist between environmental concerns on the one hand, and development actions on the other. The ubiquitous and persistent nature of this dilemma has been tied to the prevailing Western world-view, its consumerist ethic and its market based economic values of profit and competition. All of these well-established causal factors imply that if the environmental dilemma is to be resolved, its resolution would need an approach that is also deeply founded, and of wide validity and acceptance, in order to counter the hegemony of the Western socio-economic paradigm. It was suggested that the approach of sustainable development was best qualified to meet this challenge, that is to say to be an instrument of what has been called an “ecological” world-view. In the previous chapters an ethical mandate was sought, not only for this new approach, but also one that would also undergird the “ecological” world-view. However if the quest was to find a singular, universally accepted, ethical theory, it has proved to be somewhat inconclusive. What did emerge was a conglomeration of theories and ethical stances, all of which, in one or more respects, fell short of universal validity and acceptance. So, perforce, a simple moral model was proposed, based on a few very basic, intuitive ethical insights, believed to be, because of their evolutionary roots, universally held or very nearly so. Superimposed on this simple ethical foundation, space was created for any number of cultural values, which while not necessarily mutually congruent, would still be in line with the foundational ethical values. This moral model could, it was felt, support an approach towards the resolution of the environmental dilemma, that would, at heart, have an internal coherency that enjoyed wide support, but at its fringes would allow space for pluralistic interpretations. In articulating this moral model it was felt that the ethical

foundation for the approach of sustainable development had been laid.

With this background and foundation, it now becomes the main objective of this section to justify the confidence placed in the sustainable development approach as the way forward, in terms of mediating the conflict inherent in the environmental dilemma. This is done by firstly by trying to define, in Chapter 5, exactly what is meant by sustainable development. What emerges is a concept of many interpretations, some of which might appear trivial, and some even contradictory (with respect to the proposed ethical foundation and the “ecological” world-view). Further clarity is then sought by trying to uncover the essential principles of sustainable development, and in Chapter 6, its various dimensions. This Section B is then concluded by finalising, in Chapter 7, a proposed framework of sustainable development, that was first suggested in Chapter 5. This framework captures not only the heart of sustainable development, as it is articulated through the moral model derived in Chapter 4, but also its various nuances and evolving understandings that are needed to cover, in a pragmatic way, the many practical problems that it will have to come to grips with.

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## CHAPTER 5

### SUSTAINABLE DEVELOPMENT – WHAT IS IT?

... “sustainable development” has staying power because most people want to believe in it. It survives because it appears to build bridges between the demands of environmentalists and developers. It sounds comforting – human wellbeing and economic security forever, not brought to heel by ecological collapse or social distress. It is an article of faith, and in that sense almost a religious idea, similar to justice, equality and freedom. (Pearce, 1995: 287)

#### 5.1 HISTORICAL BACKGROUND

To briefly recapitulate on the historical development of the modern environmental movement, one must return to the 1960s when concerns arose around the progressive, human induced, degradation observed in the natural environment, and at the same time an awareness was building that, due to mankind’s ever increasing levels of consumption, the world’s stock of natural resources was rapidly being depleted. Initially these concerns emanated mainly from the first world countries; the developing countries were then more concerned about the pressing social issues that dominated their own national agendas. It was at a 1974 World Council of Churches Conference in Geneva, where the articulation of these differing, potentially conflicting, focusses of concern (concerns around the state of the natural environment *vis-a-vis* concerns about social conditions) gave birth to the idea of a *sustainable society*. In such a society developmental measures are aimed not only at sustaining the bio-physical environment, but also at social equity and democratic participation. The term *sustainable development* emerged in a publication of the International Union for the Conservation of Nature and Natural Resources, the *World Conservation Strategy*<sup>173</sup> (WCS) published in 1980, where it was defined as “the integration of conservation and development to ensure that modifications to the planet do indeed secure the survival and well-being of all people”. Yet the concept of sustainable development remained relatively obscure, probably due to the fact that the WCS document was perceived as still being overly biased towards

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<sup>173</sup> *World Conservation Strategy: Living Resources Conservation for Sustainable Development*, Gland, Switzerland: IUCN.

issues of the natural environment. It was only after the 1987 publication of *Our Common Future*, the report of the World Commission on the Environment and Development (WCED),<sup>174</sup> that the idea of sustainable development started to grow rapidly into the widely accepted credo that it is today. Evidently the clear pronouncements by the WCED on social development issues, in addition to its pronouncements on the natural environment, and its acceptance of the need for economic growth while simultaneously recognising the reality of environmental limits, secured a more universal acceptance, and eventually widespread popularity, for the concept of sustainable development (Dresner, 2007: 27-31).<sup>175</sup>

Sustainable development can thus be seen as a marriage between environmental concerns and social needs; a conjunction that is fuller than the mere sum of its roots. Whereas concerns with respect to nature, taken in isolation, may spawn a simplistic preservation ethic, it is obvious that the continued existence of human society will require the continued use of both renewable and non-renewable natural resources. Thus a broader perception of ecological sustainability is needed; it is a perception that allows the judicious use of natural resources. Renewable resources are not to be used beyond their rate of regeneration, and non-renewable resources not beyond the rate at which alternatives can be developed.<sup>176</sup>

On the other hand, development, as perceived in the aftermath of the Second World War, was simply taken to mean *economic* development. A consequence of this one-dimensional perception of development was the belief that developing countries had to “catch up” economically to the developed countries (Burger, 1997: 2). However it subsequently

became increasingly apparent that economic development and the environment condition ... endanger each other in a diverse and global fashion, and that environmental concepts on the one hand and social developmental concepts on the other should not be understood as alternatives, but rather that the concepts of sparing use of natural resources within the limits of their regenerative capacity – so-called ecological sustainability – need to be put in harmony with the concepts of economic and social development. (Burger, 1997: 2)

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<sup>174</sup> This commission was chaired by Gro Harlem Brundtland, one time prime minister of Norway, and hence its report has also been dubbed the *Brundtland Report*.

<sup>175</sup> A less kindly evaluation of the Brundtland Report also criticises it for fostering a “have your cake and eat it” mentality (Dresner, 2007: 36).

<sup>176</sup> A fuller understanding of the nature of environmental resources may show that for some non-renewable resources there appears little realistic chance of finding suitable alternatives.

Hence Burger (1997: 2) continued:

$$\text{Sustainable development} = \text{ecological sustainability} + \text{social and economic development}$$

This evolution of development from a one-dimensional concept to the multi-dimensional notion that sustainable development is today, can be depicted through a series of milestones (see Table 5.1).

TABLE 5.1: FROM 'CATCH-UP' TO 'SUSTAINABLE' DEVELOPMENT  
(Burger & Mayer, 2003: 7)

1949	Truman's address to the nation	Concept of catch-up development
1961	1 <sup>st</sup> UN Development Decade (1961-70)	Goal of development: economic growth (+5% GNP)
1962	<i>Silent Spring</i> by R. Carson	Life on earth is threatened
1968	UNESCO Biosphere Conference	Term "sustainable development" used for the first time
1971	2 <sup>nd</sup> UN Development Decade (1971-80)	Goal of development: economic growth (+6% GNP)
1972	<i>Limits to Growth</i> by D. & D. Meadows Report to the Club of Rome	Limited resources and the capacity of the earth to withstand burdens set limits to growth
1972	UN Conference on the Human Environment (Stockholm)	Environment or development
1983	World Commission for Environment and Development (Brundtland Commission)	Final Report (1987): "Our Common Future" with definition of sustainable development
1992	UN Conference on Environment and Development (Rio de Janeiro)	Vision of sustainable development (embracing the economy, society and the environment)

In this broad, multi-dimensional understanding, sustainable development became *the* modern development ethic, not only promoted by environmentalists but also adopted by all and sundry, including economists and politicians. It has been claimed that the popularity of sustainable development can, at least in part, be ascribed to its seemingly transcendental message in the way that "it clearly resonates with something deep within human beings", something like motherhood and apple pie (McKinlay, 2004: 43). Or as Pearce (1995: 287) puts it: "It [has become] an article of faith, ...

almost a religious idea, similar to justice, equality and freedom.”

Today, after two world conferences focussed on sustainable development (UNCED in Rio in 1992, and WSSD in Johannesburg in 2002), and smaller follow-up meetings, the recognition and acceptance that this concept has come to enjoy, is as wide as ever. It is claimed to be a basic principle in numerous governmental policies and acts of legislation, many company prospectuses and mission statements, and in the agendas and programmes of a host of non-governmental and community based organisations. Clearly the concept ‘has arrived’, but equally clearly the plethora of interpretations attached to it has blurred its meaning to such a degree that it cannot as yet claim to have ‘come of age’. So while, on the one hand, its non-specificity can be counted as a strength in that it allows spokesmen from many diverse backgrounds to claim it as their credo, its vagueness can, on the other hand, clearly also be seen as a weakness, and as a result many of the activities carried out under its banner could hardly be called sustainable.<sup>177</sup> It is thus necessary, in general, but also in particular for the purposes of this study, to determine more accurately what we mean by sustainable development. And it will also be prudent to pay some attention, in passing, to minority views that see sustainable development as, at best, a parrot-like, oft repeated empty catch phrase, or at worst, as a legitimation for unrestrained growth, which is *the* anathema of many environmentalists (Kirkby, *et al.*, 1995: 2; Hildyard, 1993). Often those who criticise the concept of sustainable development do so from a perspective that laments the lack of precision in the concept. However Burger responds to the criticism that sustainable development is an empty, indeterminate phrase as follows:

This criticism is doubly unfounded: firstly a deterministic concept of sustainable development is neither possible nor purposeful and, secondly, a vision can, even if not deterministic, most certainly guide the direction of future action. (1007: 5)

Thus for many, sustainable development remains the vision of *sound, ethical* development, and as such it is “construed as a **normative or ethical principle**” (Burger & Mayer, 2003: 8). It clear from Burger and Mayer’s words, and also from other theorists that have been previously quoted, that some see sustainable development as more than a mere strategy; they see it as an ethical guidepost. It would thus appear appropriate to investigate this ethical perspective of sustainable development, firstly to understand the concept better, but then also to compare it to the ethical model developed in the

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<sup>177</sup> For example, Eskom, the major electricity producer in South Africa, has a vast expansion plan involving the construction of several coal-fired power stations notwithstanding the heavy environmental impact of such installations, yet it claims in its 2009 Annual Report that it “has integrated sustainable development into decision-making for many years”.

previous chapter, in order to identify possible contradictions, and in the process to strengthen the latter. This then is the focus of the next sub-section.

## 5.2 THE ETHICS OF SUSTAINABLE DEVELOPMENT

Before investigating the nature of sustainable development itself in greater depth, it will be expedient, as has been suggested, to first consider, with the benefit of the ethical discourse conducted in the previous chapters, the ethical slant that many attach to the concept of sustainable development. For example, Engel expresses it as follows:

Before we accept 'sustainable development' as a new morality as well as a new economic strategy, we need to know what ecological, social, political, and personal values it serves, and how it reconciles the moral claims of human freedom, equality, and community with our obligations to individual animals and plants, species, and ecosystems. Most important, if we are morally serious, we must know on what grounds it may be said that sustainable development is a *true* ethic for human beings on planet Earth. (1990: 1)

Clearly then, Engel sees beyond the practice of sustainable development a deeper ethical imperative, and he is not alone in ascribing a moral nature to sustainable development, and hence wishing to elevate it to the level of a “*true* ethic”. For example Kothari asserts that the “shift to sustainable development is primarily an ethical shift” (1990: 35). And for Dresner,

[t]he problem in agreeing on the meaning of sustainable development is not fundamentally about agreeing upon a precise definition, but about agreeing upon the *values* that would underlie any such definition. (2007: 64)

Goulet speaks of the “moral imperative in development” which “assign[s] more importance to ethical considerations than to mere technical criteria of efficiency” (1990: 41). And Kothari warns (perhaps with specific relevance for economists and engineers) that in “the absence of an ethical imperative, environmentalism [read sustainable development] has been reduced to a technological fix, and as with all technological fixes, solutions are seen to lie once more in the hands of manager technocrats” (1990: 27). If it is thus accepted that there is an ethical injunction implicit in the concept of sustainable development, it goes without saying that it would be gainful if this ethical enjoinder could be made explicit. The moral model proposed in the previous chapter as an ethical grounding for sustainable development, was formulated without much insight into the real “essence” of sustainable development

(that being the objective here in Section B), and hence it stands to reason that if the ethical imperative that theorists see in sustainable development is in alignment with the prescripts of the proposed moral model, that that would enhance the credibility of the model. Given such a reinforced ethical grounding, one can then move forward with confidence to situations where wide-ranging policies can be formulated around the objective of sustainability, and many disciplinary practices, including engineering, can be reconstructed within the paradigm of sustainable development.

Newton is another theorist who explored the ethics of sustainable development. She argues that if present development models, as has been implied, are flawed, that mere tinkering with these models (stick and carrot approaches) will not suffice. Present development models, she argues, are uncritically focussed on meeting human demands, without consideration of the environmental costs. The application of control measures (sticks) and incentives (carrots) to contain these costs may secure some breathing space, but simply would not, in the long run, be able to stay ahead of the ever increasing human consumptive demands and the associated environmental impacts. The fundamental problem with many development approaches is that nature is still seen as an adversary which has to be subdued into compliance with human demands, or in other contexts as a supplier of unlimited environmental resources. In contrast, what is needed, is a new personal world-view which removes this adversarial stance towards nature and the *laissez-aller* approach to natural resources, and thus represents “an entirely new approach to preserving the environment and harmonizing human fulfilment with natural systems” (Newton, 2003: 7, 11, 12). In other words, development can only be sustainable if it is equitable and in harmony with nature. According to Dunstan & Swan, “we need to construct ... [this] new vision, complete with new rules, and a new vocabulary; in short, we need a new way of thinking about ourselves, and the world in which we live” (1992: 3). In a nutshell, what is required is a new world-view.

Some theorists seem less demanding in that they do not necessarily insist on the inculcation of a new world-view – it appears that for them, the simple pursuit of certain desired ethical values will suffice to ensure sustainability. Kothari (1990: 34), for example, suggests that sustainable development should reflect:

- holism
- an emphasis on participation
- the importance of local conditions, and

- a universal view that life is sacred.

Perhaps on a more pragmatic level the 1986 Ottawa Conference on Conservation and Development identified the following five broad ethical goals for the ‘emerging paradigm of sustainable development’:

- integration of conservation and development;
- satisfaction of basic human needs;
- achievement of equity and social justice;
- provision for social self-determination and cultural diversity;
- maintenance of ecological integrity. (Engel, 1990: 8-9)

In the discussion thus far it appears that the *ethics* of sustainable development is articulated, by the various theorists, on different levels. It is obvious that the ethic(s) being envisioned by some is on a significantly deeper level to that which is pursued by others. Thus some theorists would speak of, for example, a ‘new vision’, while others might limit themselves to the setting of ‘ethical goals’. One could distinguish between these levels by saying that at the deeper levels it is *foundation* principles that are being targeted, while at the shallower levels it may be something more like *operating* principles. In this study, for reasons of principle as well as lucidity, the hierarchy implied between the deeper level of ethical concepts and the shallower, maybe more practice oriented guidelines, will not only be respected but also expanded. It is believed that such an expanded hierarchy of values and principles will lend greater clarity to the concept of sustainable development. Indeed it will be the view that the precepts on the shallower levels spring from, and are fed by those on the deeper levels. Given this distinction it will, for the rest of this sub-section, be the intention to focus the discussion on the first, deeper level of ethics, which may be seen as the ethical substructure of sustainable development. In later sub-sections and chapters the precepts on the lower levels of the hierarchy will be discussed.

Returning then to the search for a fundamental ethic for sustainable development, one may associate oneself with Newton’s yearning for a more coherent ethical theory which can provide the “new vision” for society. In her quest for such a theory Newton found the traditional consequentialist (utilitarian) and deontological (Kantian) models inadequate, and instead opted for an ontological model which she expressed in terms of a modernised version of the virtue theory.<sup>178</sup> The fundamental value commitment needed, according to Newton, to support sustainable development is that of “personal integrity”. In

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<sup>178</sup> Overviews of the various traditional ethical theories mentioned in this sub-section were given in §2.2.

the sustainability context this may be interpreted as “a single, comprehensive and internally coherent worldview that is good” (Boylan quoted by Newton, 2003: 3). And from this value foundation she maintains one can derive other values such as

wisdom (including sensitivity to natural processes), courage (including patience), temperance (including frugality), justice (including respect for that which is other than ourselves), love or fidelity (including care and compassion), community, simplicity, humility, and above all responsibility, accountability, a disposition to carry out effectively stewardship of that which has been placed in our care. (Newton, 2003: 3)

Newton’s discontent with the prevailing utilitarian and deontological approaches is mirrored by Dresner (2007: 121-124). He is particularly critical of the inability of utilitarian based economic approaches to address conditions of inequity, which result from the application of the maximisation of happiness principle. These approaches may allow for some to suffer, provided that there is an overall increase in benefit (happiness). In countering the utilitarian approach Dresner lends qualified support to the contractarian moral theory of John Rawls. Rawls suggested that the most morally acceptable principles would emerge if members of society were allowed to rationally elect these principles from a hypothetical original position of ignorance. While Rawls initially focussed mainly on intergenerational equity, he later expanded his approach across generations. Here people could choose the benefits that would accrue to future generations from an originary position where no one would know to which future generation or social class they would belong. In this context we would want our “predecessors to have chosen the path of development with the best worst-case outcome for [our] generation”, an approach that would require the application of strong sustainability<sup>179</sup> and the precautionary principle (Dresner, 2007: 124-127).<sup>180</sup>

To sum up then, while environmental theorists are calling for a new fundamental approach, whether it be called a ‘new world-view’, a ‘new vision’, or a new or reborn ‘grand’ theory, it appears that, from the examples quoted, no single ethical approach emerged as clear front-runner. This is maybe somewhat disconcerting as the ubiquitous nature and urgency of environmental problems would suggest that a strong, unambiguous response is needed. In this study it is suggested that sustainable

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<sup>179</sup> See Table 6.2.

<sup>180</sup> The Bergen Ministerial Declaration of the UN Economic Commission for Europe states that “when there are threats of serious or irreversible damage, [the precautionary principle requires that] lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation” (Dresner, 2007: 81).

development may fulfil the role as a widely acceptable and broadly based corrective strategy, but then this strategy, in turn, would require an equally widely acceptable and valid ethical foundation. It could be argued that the wide acceptance of sustainable development is somewhat illusory, given that the concept is, it appears, often interpreted variously to suit different agendas. Might these variable interpretations not in themselves be a manifestation of the lack of consensus with regard to an ethical foundation for sustainable development? We have, as Dresner suggests, not yet reached agreement on the values that underlie the concept (2007: 64). However it does seem, given the preceding ethical discussion in Section A, that there are some common threads in the proposals put forward by the various ethical theorists. Certainly they all seem to discount rabid anthropocentrism, and instead favour greater moral standing for nature. While the intrinsic valuation of nature still remains contentious, the starkly instrumental value placed upon nature particularly by Western consumerist societies, has also received a widespread thumbs-down from environmentalists. Surely there are not many who would disagree with Newton that we need to “harmoniz[e] human fulfilment with natural systems” (2003:7). But despite these common threads a full scale consensus with respect to an ethical foundation for sustainable development remains elusive, and inevitably one is compelled to accept pluralistic, pragmatic approaches.

What we are left with is the need for an ethical foundation that is broadly acceptable (fulfilling the monistic yearning), but if this is not entirely attainable then still flexible enough (the pluralistic, pragmatic component) to meet the many disparate demands that will be placed on a strategy of sustainable development. Certainly this foundation will also have to allow room for, and not disavow the common threads (the non-anthropocentric, intrinsic valuation of nature) identified in the previous paragraph. It is argued here that the moral model, articulated in the previous chapter, will meet these demands. Due to its intuitive roots and hence putative universal appeal it does create a monistic impression; its acceptance of the idea of moral distance which recognises that moral uncertainty creeps in as moral distance increases, and hence that pluralistic, pragmatic approaches are inevitable; and its recognition of the intrinsic value of the nature through its endorsement of the biocentric principle, all combine to confirm the suitability of this model as the moral underpinning of sustainable development.

Focussing then on the basic values of this proposed moral model, namely beneficence and its corollary, fairness, it is perhaps necessary to confirm that these values are indeed relevant to sustainable development. For a start, it was contended that the evolutionary basis and axiomatic strength of the

ethical value of beneficence made it a universal base value. Hence it can be no other but a core value of sustainable development as well; surely no human strategy (be it sustainable development or any other) can be considered ethical if it does not, in one way or another, promote the beneficence of others? Fairness, as a value, can be said to underlie most of the virtues mentioned by Newton, and indeed also the rationale of the deontological and Rawlsian traditions. According to Pearce:

... one of the most important of the fundamental principles of sustainable development is *fairness*. This does not just apply to the rights of future generations to be able, realistically, to adjust to what this generation bequeaths them. It also applies to rights of all present generations to enjoy fundamental democratic rights and access to sustained livelihoods. The social dimension states simply, but powerfully, that a sustained society is also a truly democratic society with rights of expression, dissent, participation, self reliance and equality of opportunity. Political and economic structures have to deliver social as well as environmental sustainability. (1995: 288)

It may even be argued that the wide-spread appeal of the concept of sustainable development arises, in no small measure, from the affinity that we all feel for the notion of *fairness* (equity), and which theorists such as Pearce perceive as being inherent to sustainable development. In the same vein Dresner argues that although

sustainability is often presented as a matter of prudence, even of common sense – that you should not destroy the basis of your own existence – it is really more a question of *equity*. Concern about sustainability must be based on moral obligations towards future generations – not just personal self-interest. A crucial sentence in the Brundtland report stated: “Even the narrow notion of physical sustainability implies a concern for social equity between generations, a concern that must logically be extended to equity within each generation.” (WCED, 1987: 43) In this way, the Brundtland Commission's conception of sustainable development brought together *equity between generations* and *equity within generations*. (2007: 2)

Another cornerstone of the ethical model proposed in the previous chapter, is the principle of holism, and as such its importance with respect to sustainable development also needs to be considered. A number of theorists do so explicitly. Sterling asserts that “the growing costs of ignoring natural limits and systemic responses is forcing more and more of us into thinking holistically” (1990: 84). And Newton states:

Once we know the natural world as a community of purposes, just as is the human world, environmental moral consciousness follows immediately. This is the orientation of “holism”: it is the whole biotic and non-biotic natural community that has value ... (2003:36)

Daly claims that “the moral first principles are some concept of ‘enoughness’, stewardship, humility,

and *holism*” [emphasis added], and then he defines holism as

... the attitude that recognizes that the whole is greater than the sum of its parts, that reductionist analysis never tells the whole story, and that the abstractions necessary to make mechanistic models always do violence to reality. (Daly, 1991a: 150)

Sterling’s version of holism could be seen as an appeal for the application of systems thinking to environmental problems, and as such is not problematical. Newton may be implying that the non-biotic community (as well as the biotic community) has intrinsic value, a stance that was discounted in the previous chapter when the biocentric principle was adopted. This does not mean that non-biotic community has no value; it may still have instrumental value for entities in the biotic community, and via that route merit some moral consideration. Daly’s version of holism when seen as “epistemological holism” which “focuses ... on how best to understand ... various phenomena” (Des Jardins, 1997: 166) would be in line with the holistic thinking of the ethical model proposed in Chapter 3. However if Daly’s thinking is more inclined towards “metaphysical holism”, where “wholes are seen as real”, which then furthermore may merge into “ethical holism”, where “moral considerability ... [is] extended to wholes” which includes “nonindividuals” (Des Jardins, 1997: 165, 163), then this would be in conflict with the conception of holism as it is envisaged in the proposed ethical model. In the model wholes, such as ecosystems and species, do not merit moral consideration in and of themselves, but only to the extent that they are of instrumental value to the organisms that make up these systems. This is tied back to the notion that intrinsic value resides only in entities that are a subject of a life. Katz on the other hand, being a metaphysical and ethical holist one would judge, discounts intrinsic value altogether.

An environmental ethic, because it deals with environments, must focus its moral concern on the interdependent functioning of the entire ecological system, not merely on the (conceptually) isolated individuals who make up the system. The idea of intrinsic value loses its sense in a holistic system. (Katz, 1996: 311)

Marietta sees Katz’s interpretation of holism as extreme and unreasonable. He argues the point as follows:

We need to see clearly why extreme types of holism are logically unacceptable. A careful look at the extreme forms of holism reveals that they are extremely reductionistic, reducing human life to the barest aspects of relationship to the natural environment. These extreme forms also tend to be so abstract that they do not speak of the actual entities that we experience in our lived worlds and that our sciences study. Such an extreme holism would substitute for the richness of our lives in the world a world of abstract relationships and incomplete images of persons, animals, and plants. (Marietta, 1998: 459)

It is quite evident then that there are contradictory views on holism which may, notwithstanding, be termed as extreme and moderate holism. In this study it is the non-extreme version of holism that is favoured. While it is accepted that holism is a very important principle in environmental (or sustainability ethics), it is at the same time not posited as an extreme form holism; this is because the biocentric principle and the notion of moral distance have a moderating influence on the concept of holism. But having said that, the value of exploring all the nuances of a multi-layered concept, such as holism, goes without saying, and therefore in §7.1.1 further discussion will be devoted to this topic.

For the moment however, the finding reached earlier may be reiterated; the moral model, as proposed in the previous chapter, provides an adequate and workable ethical foundation for the concept of sustainable development.

In conclusion we may note that Engel identifies two

... task[s] on the agenda of the ethics of sustainable development ... [The first] is to reconceptualize our inherited moral ideas so that they can do justice to the full complexity of interactions within and between biological and social communities ... , [and the] second issue on the agenda [is] how to implement moral principles more effectively in practice. (1990: 19)

The first of these ‘tasks’ has now hopefully been addressed in what has been discussed up to this point. The second will be the underlying theme for the remainder of Section B.

### **5.3 WHAT IS SUSTAINABLE DEVELOPMENT?**

While much has already been said thus far about the concept of sustainable development, it has still not been formally defined. It is thus the objective in this sub-section to define the concept, or if that proves troublesome, then to describe the “essence” of sustainable development more fully.

#### **5.3.1 Defining the concept**

It is clear that the concept of *sustainable development* has not been static over time. The older

conceptualisations focussed more on the ‘greener’ issues, and in time these have been replaced by “rounder, fuller versions with consideration of the social, economic and environmental aspects of life”. This development away from a narrow focus on the natural environment to a more inclusive orientation, particularly the inclusion of social issues, is probably a principal reason why the concept has gained such universal popularity. However the price paid for this wider level of acceptance was that the understanding of the concept became more amorphous; a development that opened the door to multiple interpretations of the concept. Environmentalists, economists, social scientists, all placed different slants on their definition of sustainable development, or at least used different emphases in their interpretation of the concept (Mawhinney, 2002: 11). According to Bell and Morse

... it could, perhaps, be cynically argued that the resulting flexibility [in definition] has allowed the concept to attain the heights that it has. If those involved in sustainable development can give their own individual 'spin' to the meaning of sustainability, then all definitions can remain fashionable and mainstream, and this may help to strengthen its popularity. The uncertainty may, in fact, be self-reinforcing and sustainable in its own right. In a less cynical vein, this flexibility as to what sustainability means can also be a great strength in a very diverse world. People differ in the environmental, social and economic conditions within which they have to live, and having a single definition that one attempts to apply across this diversity could be both impractical and dangerous. (2008:12)

So the fact is that there are a host of different definitions<sup>181</sup> of the concept (before the turn of the century Kirkby, *et al.* (1995:1) already reported more than seventy, and eight years later Parkin, *et al.* (2003: 19) reported over 200 definitions), and while some aspects of these definitions might be considered mutually exclusive, it also appears that many share, to some degree, a common intent, albeit if expressed in different words, and at times from a different perspective. In the face of such a plethora of definitions Bell and Morse note that some authors have eschewed the need for a precise definition of sustainable development, and instead prefer to proceed directly to sustainability practice which, so they contend, need not be undermined by the lack of a generally accepted definition. On the other hand, Bell and Morse, while not refuting the need for a definition of sustainable development out of hand, feel that the search for a definition is often hampered by the misperception that a definition needs to be a single sentence summary of the concept, whereas the concept may be more adequately described

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<sup>181</sup> Many writers treat sustainable development and sustainability as synonyms, and for the moment a similar approach will be followed here, but later this issue will be addressed more fully.

through a set of statements or principles (2008: 11). However, for the moment, the idea of a succinct definition of sustainable development will be pursued here, even if eventually one may have to concur with Bell and Morse that a broader framework, which includes elaborations in the form of principles and dimensions, will be a more suitable vehicle for capturing the spirit and extent of the concept.

Another reason which may contribute to the difficulty in finding a universally acceptable definition for sustainable development, is the inherent tension present in the concept. According to Newton “‘sustainable’ means (at least) ‘maintaining equilibrium in the long term’ and ‘development’ means (at least) ‘progressive irreversible change’ and [hence] we are surely dealing [here] with an oxymoron, a contradiction in terms” (2003: 4). Recognising this contradiction theorists have proposed different ways around the problem. Caldwell suggests that, “Sustainability joined to development might be defined as continuity of a *process* [emphasis added], not necessarily of a condition or quality.” (2001: 1742)<sup>182</sup> Dunstan and Swan, after cautioning against the degeneration of the concept into a mere slogan, proceed by contending (in the words of Plant) that, “the sloganeers have got it upside down. The task is to *develop sustainability*” (1992: 4). Other writers<sup>183</sup> suggest that it is the interpretation, in the phrase ‘sustainable development’, of the term ‘development’ as *material* development (or economic growth), that is deficient, and that an interpretation, nuanced towards the notion of an improvement in *quality of life* (which does not necessarily imply economic growth), is more appropriate. But such nuances notwithstanding, it seems that some theorists avoid, or even oppose the use of the concept.

Nevertheless the phrase *sustainable development* remains in vogue, but given its internal tension some commentators<sup>184</sup> favour, in its place, the use of the word *sustainability*, where the latter usage would try to de-emphasise the focus on (economic) growth that may be implied by the former. But on the other hand, if there is then an inclination to use ‘sustainability’ rather than ‘sustainable development’, the first mentioned usage will beg the question: the

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<sup>182</sup> Compare this with Mawhinney’s “starting point”, “process”, and “end-goal” triad discussed later in this subsection.

<sup>183</sup> Here writers such as Newton (2003) and Daly (1996) come to mind.

<sup>184</sup> See Robinson, 2004.

sustainability of what? Bell and Morse mention the following: “sustainable agriculture, sustainable coastal zones, sustainable cities, sustainable communities, and sustainable organisations and institutions” (2008: 5). Another expression that might be used as an alternative form of sustainable development is *environmental sustainability*, but it is far less popular and can only serve as a synonym to sustainable development if the broad understanding of the environment, as set out in Chapter 1, is accepted. In other contexts environmental sustainability is taken to refer more specifically to the sustainability of the natural environment, which is also sometimes referred to as *ecological sustainability*. In many instances, such as for example in Agenda 21,<sup>185</sup> the terms ‘sustainability’ and ‘sustainable development’ are both used and are treated as synonyms. This study will follow a similar approach. The phrase ‘sustainable development’, will be used in the main, this approach being favoured because of the widespread acceptance and popularity of the phrase, but in addition the word ‘sustainability’ will also be used synonymously, where it might seem appropriate or less cumbersome.

In order to probe deeper into the full meaning of *sustainable development*, it might be informative to take a separate look at the meaning of each of the two words that make up the phrase. A dictionary<sup>186</sup> definition of *sustain* refers *inter alia* to the following: to *maintain*; to *keep going* and to *keep up*. Quite obviously then, there is, within the concept of sustainable development, a notion of continuity over time, otherwise expressed as a future perspective, which means that both components of the environment, society and the natural environment, should remain healthy and functional over a period of time, probably even indefinitely from a theoretical perspective. Newton, in an attempt to be more specific and practical suggests a period of seven generations; i.e. 210 years (2005: 1-2), while Donnelly and Boyle suggest a 1000 year perspective (2006: 149). Bell and Morse (2008: 14-17) elaborate quite extensively on the length of the time period, and also on its starting point, demonstrating that variations in these parameters significantly affect the assessment of the sustainability. They furthermore interpret sustainability to mean that the “system quality” will not reduce over a time period (Bell and Morse, 2008: 13). Thus one may conclude that sustainability can only be broadly assured if the outcome over the longer term, irrespective of the starting point, indicates no loss

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<sup>185</sup> Agenda 21 is a global action plan for sustainable development that emerged from UNCED.

<sup>186</sup> *The New Imperial Reference Dictionary*, (undated). London: George Newnes Limited.

in system quality, where the system could be any environmental (widely understood) structure of interrelated relationships.

A dictionary<sup>187</sup> defines *development, inter alia*, as to *grow; to exploit natural resources, to advance through successive stages to a higher, more complex, or more fully grown state*. So if we accept the simple interpretation that development means growth, the question then arises: what must grow? According to Caldwell (2001: 1740), in the aftermath of the Second World War, development was perceived mainly as economic growth, and as such became a goal of public policy. According to Sachs (1999: 25) US President Harry Truman, in reference to the poorer countries coined the phrase “underdeveloped areas”. This was an expression of the world-view that saw

all the peoples of the world ... moving along the same track, some faster, some slower, but all in the same direction. He saw the northern countries, in particular the US, running ahead, while the rest of the world – with its ridiculously low per-capita income – were lagging far behind. ... Truman conceived of the world as an economic arena where nations compete for a better position on the GNP scale. ... Consequently, it was the objective of development policy to bring all nations into the arena and to enable them to run the race. (Sachs, 1999: 25)

This emphasis on the economic dimension of development arises from a “general disassociation of economics from other aspects of life and the unequivocal elevation of material values to a dominant and definitive role in development planning” (Caldwell, 2001: 1741). To complicate the issue, classical economists speak of *sustainable growth* as an alternative form of sustainable development. However, as Daly is at pains to point out, with the economic system being a subsystem of the larger, but finite, global ecosystem, continued economic (material) growth over the long term is impossible, and hence the “term sustainable growth should be rejected as a bad oxymoron” (1991b: 6). This kind of bias in the interpretation of development may be precisely why some environmental groupings are sceptical, if not downright opposed to the concept of sustainable development. For example Holmberg and Sandbrook object to sustainable development precisely because “it appears to license economic growth” (Kirkby, *et al.*, 1995: 2). Continuing with this criticism against the economic interpretation of development, Berdyaev (as quoted by Caldwell, 2001: 1741) coined the term “economism”, which he defined as a mind-set that “postulates economic values as fundamental to all others,

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<sup>187</sup> Ibid.

and employs economic criteria as the primary measure of the worth of all human activities” and which when “combined with an uncritical acceptance of innovating technology” creates “a new artificial environment incompatible with the needs of the whole man”. As a counter against these deficient “traditional economic assumptions” Caldwell asserts that “an informed and rational concept of *sustainability* needs to be widely accepted and internalized in the ethos and ethics of human society, and applied critically to the concepts of *growth*, *development*, the *economy* and the *environment*” (2001: 1741; [emphases added]).

To reiterate then, economic growth implies increasing use of natural resources, but living, as we do, in a finite world, it is only logical that there must be limits to the supply of these natural resources. And hence one would conclude that development could only be sustainable if the use of natural resources was at rates lower than that of their natural regeneration (or substitution some economists would argue). We not only use natural resources, we also use nature as a sink for our wastes, and sustainable practice in this regard requires our waste generation to be at rates lower than the rates are at which nature, without suffering permanent damage, can assimilate these wastes. Unlimited economic growth is therefore not possible, whether taken from the perspective of resource utilisation limits, or from the perspective of the waste assimilation limits of nature. Nevertheless most environmentalists would probably accept the need for some economic growth particularly so that the poor could escape the shackles of dire poverty, but once reasonable standards of living are reached, they would argue that the growth should transform from quantitative to qualitative growth. Put differently:

Population growth and production growth must not push us beyond the sustainable environmental capacities of resource regeneration and waste absorption. Therefore, once that point is reached, production and reproduction should be for replacement only. Physical growth should cease, while qualitative improvement continues. (Daly, 1996: 3)

Newton concurs by suggesting that in order to make development compatible with sustainability, it needs to be idealistically re-conceived to “mean the refinement of human existence, to include [only] sufficient material goods to maintain life ... free ... from the demands of survival, in order that human beings might work toward the betterment of the world in general” (2003: 2).

In the same tenor, while also arguing against a simplistic, linear conceptualisation of

development as series of stages through which developing countries must go in order to become ‘developed’, Rihani and Geyer, see ‘underdevelopment’ as a set of prevailing conditions that are “the exact opposite of those required for development”. They assume that “the development process is a complex adaptive system, ... [where] the internal elements of the system [are] interacting human beings, as individuals or groups”, and then argue further:

Too few interactions result in a state of stultifying order, while too many could lead to chaos. The layer of self-organized complexity that lies at the edge of chaos could only emerge if individuals were *free* to interact and *capable* of interacting, and if their interactions were facilitated by *appropriate rules* that command popular support. (Rihani & Geyer, 2001: 242)

Thus for Rihani and Geyer development means addressing the lack of freedom, and the incapacitation produced by “malnutrition, disease and illiteracy” in ‘underdeveloped countries’, as well as the establishment of a “framework of rules ... [aimed at achieving] a state of evolving self-organization.” (2001: 242-243)

Having thus investigated the meaning of each of the two words that make up the phrase ‘sustainable development’, it now remains to investigate the phrase itself, or more accurately, the concept that it represents. In pursuit of this quest to discern the “essence” of the concept of *sustainable development*, one could do worse than turn to the so-called Brundtland Report (produced by the World Commission on Environment and Development (WCED in 1987), the document that, in the eyes of many, transformed the theoretical concept of sustainable development into the popular credo of society that it is today. The Commission in its investigations came to the conclusion that the stresses being experienced in the natural environment were irrevocably linked to social conditions, be these conditions of poverty or affluence. It firmly connected the social concerns of population growth, poverty and equity, to concerns that arose from the degradation of the natural environment. Moreover it was not only “poverty itself [that] pollute[d] the environment”, but indeed also the wealth and materialism of industrialised societies that exacted an even heavier per capita toll on our natural resources (WCED, 1987: 28-36). The Commission came to the following conclusions:

- that environmental stresses are linked to one another
- that environmental stresses and patterns of economic development are linked to one another
- that environmental and economic problems are linked to many social and political

factors, and

- that these systemic features operate not merely within but also between nations (WCED, 1987: 37-38).

So, not only did the Commission recognise the importance of social issues, but also the interrelatedness of social and environmental issues, and by implication the necessity for holistic solutions. It noted that environmental management practices were largely aimed at “after-the-fact repair of damage”, or focussed on “the symptoms of harmful growth”, and to that extent were inadequate. It sought a new approach which “integrates production with resource conservation and enhancement, and links both to the provision for all of an adequate livelihood base and equitable access to resources” (WCED, 1987: 39-40). Thus it arrived at the ideal of sustainable development, to which it gave the definition that has, one could safely say, become the most widely quoted definition of sustainable development:

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. (WCED, 1987: 43)

In this way the report implies that sustainable development includes

- the necessity to meet basic needs
- the recognition of the limitations in the natural environment
- a search for equity (inter- and intra-generational) (Dresner, 2007: 67).

The Brundtland Report is not without its detractors. Some argue that it has sold out to economic growth in that it sends a message to the people that “they could have everything they wanted and that nobody would have to make sacrifices” (Dresner, 2007: 36). After accusing the Commission of “being less than rigorous in avoiding self-contradiction”, Daly does concede that the report “after all provided a political opening for the proper concept of sustainable development to evolve, and that is quite an accomplishment” (1991b: 6).

Moving beyond the Brundtland Report, it might also be argued that sustainable development needs to do more than merely meeting “basic needs”. Thus for Konrad Ott,

Sustainability means that present and future persons have the same right to find, on average, equal opportunities for realising their concepts of a good human life. (2003: 60)

So while Ott reiterates the intergenerational equity requirement, he also adds a “broadly defined teleological objective (‘good human life’)” (2003: 60). Obviously the present generation may not be able to accurately predict a future generation’s perception of the ‘good human life’, but whatever it may be, it must be (even as the present generation’s ‘good human life’ should be) environmentally sustainable.

As has already been said, there are many other definitions of sustainable development, and these often exhibit differing emphases according to the predilections of the formulators. A number of these definitions are listed in Appendix B. From most of the definitions one can discern certain common characteristics, such as the aims

- to improve the quality of human life
- to find an equitable distribution of resources, and
- to remain within the limits set by nature.

Of more pertinence to the South African situation may be the official view of sustainable development as it becomes evident in national legislation and policy. The National Environmental Management Act of South Africa, Act 107 of 1998 (NEMA),<sup>188</sup> defines sustainable development as the “integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations” (South Africa, 1998: 10). Noticeable here is the explicit three-fold dimensionalisation of sustainable development into *social*, *economic* and *environmental* components, an expanded and very useful conceptualisation.<sup>189</sup> While it is true that NEMA does expand on the concept of sustainable development in later sections, the definition, as it stands, appears rather lightweight on the important characteristics of quality of life, equity and natural resource limits, which can, at best, only be said to be implicit in the definition. Also present seems to be a clear anthropocentric bias, a characteristic not uncommon in many of the definitions of sustainable development. In fact, in this regard NEMA is quite explicit:

Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social

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<sup>188</sup> NEMA is arguably the most senior environmental law in the South African context.

<sup>189</sup> This three-fold conceptualisation of sustainable development foreshadows an extensive discussion on the dimensions of sustainable development that is still to follow in Chapter 6.

interests equitably. (South Africa, 1998: 10).

The quality of life and equity shortcomings in the definition appear to be addressed here, but some might argue, at the expense of the environment. The ultimate aim of sustainable development is seen as human well-being, and concerns for the natural environment arise mainly around its capacity to meet human “needs”, and not because the environment is valuable in and of itself. This anthropocentric bias is the reason why some theorists tend to distrust the concept. For example Siegfried asserts that “stripped of obscurantism, sustainable development is a theoretical construct for grand-scale social engineering” (2002: 56).

It might be appropriate to expand a little here on some the criticisms levelled against sustainable development as a concept. Often these criticisms spring from the vagueness around the concept. It is claimed that because of this vagueness interpretations are attached to sustainable development which are, if not broadly unsustainable, then more specifically anthropocentric, inequitable or inefficient. An example of the anthropocentric interpretation is the NEMA definition which has already been discussed here above. In terms of equity it has been argued, for instance, that the beneficiaries of sustainable development are often the wealthy and the powerful, and not the poor and those specifically in need of development. For example, if interpreted in a certain way, sustainable development may seem to legitimate even more (economic) development in countries of the North<sup>190</sup> to create markets for the South, while at the same time it is underrating development in the South by focussing on the population growth and the degradation of the natural environment in these countries. Instead, to be more equitable, some critics would argue that for developed countries sustainable development should rather indicate ‘de-growth’,<sup>191</sup> that is to say “nations of the North [sh]ould consume, on balance, much less in the way of material goods and far less energy” (Newton, 2003: 2).

Other criticisms directed at sustainable development include its wide ambit, as is evidenced by its adherence to the principle of holism. The inclusion of everything under sustainable development, as implied by this principle, renders the concept, it is claimed, meaningless.

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<sup>190</sup> The North/South nomenclature was introduced in Chapter 1.

<sup>191</sup> See Alier, 2009.

Another criticism of sustainable development is the contention that no reasonable person would support unsustainability, which reduces the concept to a triviality. It is also argued that because of the unpredictability of natural and economic systems, sustainable development policies carry unquantifiable risks. Also it is said, the long term view of sustainable development is incompatible with the short term horizon of public policy makers (Newton 2003: 3).

The above criticisms of sustainable development notwithstanding, the wide-spread acceptance of the concept remains undeniable, and that in itself is a major strength of the concept on which further refinements of the concept can be built. Kates, Parris & Leiserowitz sum the position up as follows:

Yet, despite these critiques, each definitional attempt is an important part of an ongoing dialogue. In fact sustainable development draws much of its resonance, power, and creativity from its very ambiguity. The concrete challenges of sustainable development are at least as heterogeneous and complex as the diversity of human societies and natural ecosystems around the world. As a concept, its malleability allows it to remain an open, dynamic, and evolving idea that can be adapted to fit these very different situations and contexts across space and time. ...

Despite this creative ambiguity and openness to interpretation, sustainable development has evolved a core set of guiding principles and values, based on the Brundtland Commission's standard definition to meet the needs, now and in the future, for human, economic, and social development within the restraints of the life support systems of the planet ...

Importantly, however, these underlying principles are not fixed and immutable but the evolving product of a global dialogue, now several decades old, about what sustainability should mean. The original emphasis on economic development and environmental protection has been broadened and deepened to include alternative notions of development (human and social) and alternative views of nature (anthropocentric versus ecocentric). Thus, the concept maintains a creative tension between a few core principles and an openness to reinterpretation and adaptation to different social and ecological contexts. (2005: 20)

So it can be seen that the perception of sustainability as open to contextual interpretations around core principles is, to some extent, mirrored by the structure of the ethical model proposed in the previous chapter, and which therefore reinforces the thinking on sustainable development as it is proceeding in this study.

As regards the alleged anthropocentric bias of sustainable development, Arne Naess, the

founder of the deep ecology movement, recognised the dissonance between the radical environmental positions and the human centred environmental ethical approaches, and in his view this discord revolved around the basic question of “whether non-human life is of intrinsic value or only of utilitarian value” (1990: 89). But then, importantly, he went on to find sufficient common ground between the opposing positions to assert that we not only need “sustainable development for the satisfaction of human needs”, but also because it “protects the planet for its own sake” (1990: 90). In following Naess’ line this study will assume the pragmatic position that the wide acceptance of the concept of sustainable development provides, notwithstanding is human bias, the grounds for constructing, at least in effect, a defensible basis for environmentally sensitive practice.

Furthermore when Engel claims that, “Sustainable development, conceived as a moral ideal, challenges the traditional separation in ethics of theory from practice” (1990: 11), this study adopts the pragmatic position that from sustainable development practice theoretical insights may develop that could, in the longer term, lead to the fundamental societal re-orientation which some theorists see as a necessity if society is to survive. This assertion reflects the conviction that sustainable development is an *evolving* concept. In time, some of its precepts may change, with new ones being added and old ones being amended or discarded, but at the same time there is, at its heart, a constant ethic of people and planet concern.

To round off the discussion on the criticisms of sustainable development one may fall back on Simon Dresner’s summative argument:

Some environmentalists have claimed that sustainable development is a contradiction in terms, and can be used merely as a cover for continuing to destroy the natural world. On the other side of the debate, some economists have argued that sustainable development is too cautious about the future, potentially leading to sacrifices of economic growth for the sake of excessive concern about depletion of natural resources. Defenders of the concept argue that disagreement about sustainable development does not show that it is meaningless. Rather, it is a 'contestable concept' like liberty or justice. Most people support these goals but disagree about what exactly constitutes liberty or justice. It is also sometimes argued by environmentalists that the compromises inherent in combining 'sustainable' with 'development' were a necessary price to pay to get the idea of sustainability into the political mainstream at all. (2007: 2)

Making sustainable development a main pillar of this study, does not remove the vagueness,

the contestability and the tension inherent in the concept. Despite these negatives, it is argued here that the widespread acceptance of the concept is an overriding strength. It is deemed prudent to proceed with the concept even it is somewhat deficient in terms of clarity, knowing that its general acceptance is a reality, and that as an evolving concept it can, with time, reduce the negatives associated with it. The varied interpretations of the concept are thus not sufficient for its rejection, but rather call for debate and clarification.

In this spirit we could return to Dresner's argument that at least part of the reason for the ambiguities around the concept of sustainable development lie in it being a "contestable concept" like "liberty" or "justice", all of which are primary concepts despite not being easily definable. Daly (1996: 2) feels that the similarity between sustainable development and concepts such as "justice" and "democracy" lies in them being *dialectical* concepts rather than *analytical* concepts. Concepts of the latter kind can be defined unambiguously and have singular meanings, whereas dialectical concepts are more open to interpretation and can in some circumstances have a meaning somewhat different from what the case would be in other circumstances. To therefore insist on an unambiguous definition for sustainable development would not only be futile but also counterproductive.

But even if one should agree with Dresner's and Daly's assessment of sustainable development as an ambiguous and a dialectical concept, and hence accept the characteristic imprecision associated with such concepts, this does not remove the need to strive for as much clarity in one's understanding of the concept as may be possible. This is necessary in order to reduce alternative interpretations of the concept which could lead to contradictory, and even unsustainable, practices. As Daly argues, "the stakes are very high ... [and] a largely undefined ... [conceptualisation of sustainable development] sets the stage for a situation where whoever can pin his or her definition to the term will automatically win a large political battle for influence over our future" (1996: 1, 2). This study will therefore heed Daly's warning and continue to analyse more closely the "essence" of the concept (in this chapter), and also explore more intensively the principles and the dimensions that support and elucidate the concept (in the following chapters).

In an attempt to get more closely to the "essence" of the concept of sustainable development

one could join with Mawhinney (2002: 2) in raising the following question: “Is sustainable development a concept that defines a starting point, or does it define the process necessary, or should it be the defining end-goal?” There does not appear to be much support in the literature for the view that sustainable development is a starting point. Indeed it would be somewhat ironical if the concept of sustainable development, after more than thirty years of debate, and loaded with the expectations and hopes that it is, can at this stage still only be deemed to be a starting point. What would be more significant, is the question of whether sustainable development is a process or an end-goal. Whereas in the first case more focus would then fall on the evolutionary nature of sustainable development, the latter interpretation would rather predicate some degree of finality to one’s understanding of the concept. That the distinction between these diverse interpretations could evoke strong arguments is evident from the following quote.<sup>192</sup>

But beyond that there is a broader question as to whether justice and ethics are about processes and procedures internalized within democracy, the market, self-governance or whatever without regard to the end-state (if there is one), or whether they should attach to outcomes. If the latter, then are there well-defined end-states, specifiable in advance, which define the goals of a truly just and ethical condition of human life in and with nature? Some (e.g. both Nozick and Derrida) insist that any definition of justice or of ethics that specifies an end-state is unjust and that a justice of process (‘doing justice’) is all that matters. (Harvey, 1999: 112)

So there are a number of theorists who appear to favour the view that sustainable development is a process. Harrison, for example, concludes,

In the absence of an objective definition (e.g., from science) or a consensual, policy-relevant definition, sustainable development can only be understood as an evolving process in which social and political institutions continuously adapt to changes in scientific knowledge, social values, and ethical concerns ... [S]ustainable development is the process of continuously enhancing social adaptive capacity. It is not a place to go; it is a way of traveling. (2000: 8, 9)

Burger (1997: 1, 5) states quite bluntly that sustainable development is “primarily a political and social process” and that it “requires constant negotiation”. AtKisson says simply:

Sustainable development is the practice of aiming development toward sustainability. (2009: 5)

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<sup>192</sup> While the quote given here refers directly to (environmental) ethics and justice rather than sustainable development, the argument may be extended to sustainable development as environmental ethics and justice are in any case considered to be necessary conditions for sustainability.

From an engineering perspective, Wallace, a senior member of an international consulting engineering practice, seems a little more ambivalent about the status of sustainable development when he speaks of

the construction of this pathway towards sustainability [which] should be built incrementally through a series of successful projects that not only meet client needs, but truly represent progressive but substantive steps towards sustainability. (2002: no page numbers)

Thus Wallace seems to lean more towards the view of sustainable development as an end-goal. Many definitions of sustainable development follow this trend of positing the concept as an ideal to strive for, a hoped for end-goal. With an almost utopian sweep Hawken, *et al.* (as paraphrased by Newton) suggest an end-goal with a

... vision of a restored earth, with human houses that produce more energy than they consume, transport that is silent and free from emissions, factories that clean the water they use, and all humans, even the higher number of humans expected in the next century adequately housed and well fed. (Newton, 2003: 52)

Hedrén and Linnér see a role for sustainable development in utopian thought where the latter is described as a “source ... of inspiration and [a] driving force ... for reflections on how to design politics for a better future society”, which in addition also requires “a specific morality, an explicit idea of what is ... right and wrong for society as a whole” (2009: 197-198). They continue:

The many principles agreed on in the UN summits and conferences must be translated into institutions, organizations, and ways of life, and utopian thought has the potential to promote such a development. The project of sustainable development demands a thorough integration of the social, economic, and ecological spheres, and in some interpretations even calls for quite a different world order. Consequently, there is an urgent need to theorize and to develop utopian thought about social, economic, and ecological relationships on a global scale. (Hedrén & Linnér, 2009: 198-199)

McKinlay feels that some of the criticisms attracted by sustainable development arise precisely from the expectation that it should be process prescriptive, and as a result she suggests that its purpose should rather be that of a vision that can guide future action (2004: 46). Newton, quite unreservedly, contends that “[s]ustainability is an end, and for most purposes it remains for us

only to specify the means that will effectively achieve it” (2003: 7). She defines sustainability<sup>193</sup> as the state reached where a human activity “can be maintained profitably and indefinitely, without degrading the systems on which it depends” (2003: 5). She further suggests that, to achieve this level of sustainability, we need to inculcate a new “personal worldview of a life in harmony with environmental sustainability in all its enterprises” (2003: 42).

AtKisson warns that there is the danger too that in taking sustainable development as a process it results in practice that is “incrementalist, conservative, [and] market-privileging ... masking the fact that things that matter are [actually] getting worse; or, it may in fact be making them worse”. On the other hand the “goal [emphasis added] of sustainability carries with it an imperative to go beyond incremental improvement, and to consider transformative changes in the deeper structures of [societal] systems”. AtKisson continues,

A climate-neutral economy ... a world free from hunger and poverty ... all children afforded the education and other essentials promised to them in the Universal Declaration of Human Rights ... these things cannot be achieved through Clean Development Mechanisms and other market-based instruments alone. They must be achieved by ethical commitment, by social change, by building public understanding and willingness to sacrifice (in the sense of undergo wrenching transitions) for the greater good, the good of future generations and the health of planetary ecosystems. (2009: 5-7)

As this study has attempted to show, the environmental problems that beset the world require new mind-sets and practices. These problems are in part the result of a society whose lifestyles and demands are not in tune with its environment, and if the new mind-sets and practices are not adopted, the continued existence of this society is in peril. In other words society, as it is presently constituted and functioning, is not sustainable. As human society we are not doing a good job – things could *be better*, and we should be pursuing this better option, and this implies having a clearer vision of our end-goal.

This study thus conforms to the idea that sustainable development represents the pursuit of an end-goal, albeit with some slight modification. It is here proposed that the end-goal or vision<sup>194</sup>

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<sup>193</sup> This might be one of those occasions where *sustainable development* and *sustainability* are not considered synonymous, as the former might represent the process and the latter the end-goal.

<sup>194</sup> As will be explained later the preferred term used in this study is *vision* rather than *end-goal*.

be that of a *sustainable society*.<sup>195</sup> A sustainable society may be seen as a society *that lives comfortably and in harmony with its environment*. Is it conceivable that sustainable development advocates have anything else in mind other than this vision, whether articulated or not? It is argued here that it is highly unlikely they could, and furthermore that no rational person would pursue an *unsustainable* society. One could therefore reasonably claim that the vision of a sustainable society must be broadly acceptable. Having accepted this vision, the next logical question is, how is this sustainable society brought about? The argument being put forward here is that sustainable development now becomes *the process whereby a sustainable society might be realised*. In Codner's words

Sustainability is *the ability to maintain a desired condition* [the sustainable society] *over time*. Sustainable development is *a tool for achieving sustainability*, not the desired goal. (1995: 55)

Given this interpretation, the need for an elaborate, comprehensive definition of sustainable development shifts to that of describing a sustainable society, which on the face of things would appear to be easier to do (it has already been attempted here above), and sustainable development itself is relegated to the level of practice, where any action aimed at making society more sustainable is deemed to be part of the sustainable development process. Is sustainable development a starting point, or a process, or an end-goal? This study concludes that it is more appropriate to speak of a sustainable society as the end-goal, and of sustainable development as the process whereby it is realised.

It could be argued that the above reasoning simply waters down the meaning of sustainable development; clearly some theorists have a deep concept in mind, one that can be, as has been suggested, associated with a new paradigm or mind-set. But, in response, it could be reasoned that the idea of presenting sustainable development as a process, is only done against the background of having chosen a sustainable society as an end-goal, and that the interpretation of this twin conceptualisation need be no shallower than that of sustainable development itself. In addition it could be argued that this 'process combined with an end-goal' approach lessens the need for an exact definition of sustainable development, and instead focusses on a description of the process. In line with this thinking the discussion that follows is based on the

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<sup>195</sup> This concept is the focus of the publication *Caring for the Earth* (IUCN, UNEP & WWF, 1991), and it also describes in detail the principles which define such a society.

belief that it would be more profitable to try and convey the “essence” of sustainable development through a range of descriptors rather than labouring over an exact definition.<sup>196</sup>

### 5.3.2 A framework for sustainable development?

In analysing the literature around sustainable development, one comes across descriptors such as definition, vision, end-goal, principles, dimensions, guidelines, indicators, etc. It may be useful, in the context of the argument used in the preceding paragraph, to define these descriptors more specifically with the objective of using them in an integrated structure that could better convey the meaning and ambit of the concept of sustainable development. In general, these descriptors will be used in a hierarchy which ranges from a higher level of succinct descriptions with overarching validity, to a lower level of longer, more detailed descriptions with limited ranges of validity. In other words the higher levels of the hierarchy will tend towards widely accepted tenets, if not immutable axioms, while the lower levels will not only have narrower areas of validity, but also be more open to debate and disagreement.<sup>197</sup>

To repeat the words of Kates, Parris and Leiserowitz:

Thus, the concept [of sustainable development] maintains a creative tension between a few core principles and an openness to reinterpretation and adaptation to different social and ecological contexts. (2005: 20)

This proposed structure of hierarchically arranged descriptors, or *sustainable development framework*, as it will be called here, could loosely be compared to the modern process of strategic planning that is characteristic of progressive organisations and companies. This strategic planning, carried out by an organisation, is based on developing a framework of goals and actions, the purpose of which is to focus the company’s operations in the face of the competitive challenges of the day. The strategic framework so developed usually contains most of the following components:

- the organisation’s vision
- an articulation of the organisation’s values
- a mission statement

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<sup>196</sup> This echoes the approach of Bell and Morse (2008: 10-11).

<sup>197</sup> This is where pluralistic, pragmatic treatment is needed.

- the goals aimed at accomplishing the organisation's mission
- the key result areas which will be the focus of action
- specific action plans for implementation of the strategic plan, and
- monitoring steps to assess the progress made.<sup>198</sup>

The descriptors employed in the above strategic framework are the words that are underlined. Using the strategic planning model and the rationale embedded in its hierarchy as a frame of reference, an attempt will now be made to derive a framework for sustainable development.

The proposed framework will have, at the highest level, the *vision* of sustainable development. This term, vision, is preferred to the alternative, end-goal, that has been used mostly thus far. It is felt that the latter term might appear relatively mundane and easier to achieve than the former, which carries an utopian flavour (as discussed earlier) and hence is more in line with the expectation of a possible change in paradigm or world-view. On the other hand, the term 'vision' may imply a goal that is only realisable in the long term, if ever. In the present imbroglio around limited natural resources, high consumer demands, exponential population growths, global environmental threats, and the fractured interpretation of sustainable development, there is an urgency that requires more rapid resolution. In response to this concern it might be said that the vision is only part of the proposed framework, and that at the lower levels of the framework one could expect much more immediate guidance in terms of what needs to be done in the short term.

It has already been intimated that the vision considered appropriate for sustainable development is that of a *sustainable society*. What else could be an adequate objective of all the debate, all the strategies, and all the activities which occur under the banner of sustainable development? Is it not all aimed at making society sustainable? However, one may still ask if the debate around the vagueness of the concept of sustainable development has not simply been transferred to the notion of a sustainable society. What is a sustainable society? The answer to this question, it is argued here, is not too difficult to pin down. Surely a sustainable society is simply one that continues to be in the long term? In this study the following modest definition

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<sup>198</sup> See Shapiro (undated) and McNamara (2006).

is suggested: *a sustainable society is one that maximises the well-being of its members while they live in harmony with their environment.*<sup>199</sup>

AtKisson is also of the opinion that a sustainable society

can be fairly easily defined and even quantitatively described for a vast array of ecological, economic, and social systems. Skyrocketing crime is not sustainable; ... [d]ecaying ecosystems are not sustainable; ... [e]ver-increasing leverage in the global financial system is not sustainable; [etc.] (2009: 6)

AtKisson is correct in saying that certain things such as “decaying ecosystems” are not sustainable – that is the easy part; the more difficult part is to find out how we would know that an ecosystem is decaying? Human impact on ecosystem does not necessarily mean that it is decaying. And if some ecosystems decay while others thrive is that sustainable? The point being made here is that, while a sustainable society might be relatively easy to define, it is far more difficult to establish if the society is actually sustainable. A society might strive to be sustainable, but to determine when it reaches that goal is not easy. That is why the proposed sustainable development framework cannot stop at the level of vision; it needs to be expanded so that the descriptors at the lower levels, and their content, provide more guidance in terms of a fuller understanding of what a sustainable society is, and how it can be achieved.

At the next level of the framework it is proposed to install the *values* (or the ethics) that underlie a sustainable society, and that drive sustainable actions. Previously it has been argued that the most fundamental values that underlie sustainable development, and that are practically universal and therefore least likely to invoke opposition, are those of beneficence and fairness. One may feel a need, considering for example Newton’s list of values (2003: 3), for more values to be included here, maybe such values as justice and wisdom. However the values of beneficence and fairness are so basic that most other values can be subsumed under them, and one must also not forget the criterion of wide acceptability. Given too the previously accepted

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<sup>199</sup> A critic might now insist on having further clarity on what is meant by *well-being* and *harmony*, but in the context of *dialectical* concepts do such questions not hint at pedantry? It is suggested here that to most people the proposed definition is comprehensible enough for it to serve as a vision. If further elucidation is needed, reference may be made to *Caring for the Earth* (IUCN, UNEP & WWF, 1991). It can also be argued that the remainder of the proposed framework for sustainable development will fill out, to a large measure, the understanding of a sustainable society. It may also be noted that the vision of the South African Department of Environmental Affairs is formulated as follows: “A prosperous and equitable society living in harmony with our natural resources.” (Available at [https://www.environment.gov.za/?q=content/about\\_us/overview\\_department](https://www.environment.gov.za/?q=content/about_us/overview_department) [Accessed on 17 April 2013])

premise that our ethical understanding is evolving, and indeed that the concept of sustainable development is an evolving concept, then one can see that the installation of beneficence and fairness as the base values of sustainable development into the framework, need not be the last word on this subject. (It needs to be reiterated that it is the nature of the proposed framework to be flexible towards alternative or additional inputs, particularly at its lower levels.)

At a next level of the strategic planning process one comes across the mission statement which does not really fit very well into the sustainable development framework being assembled here. Instead it is thought that this might be the appropriate level at which to introduce the *principles* of sustainable development. In the literature on sustainable development reference is often made, and examples given of such principles. In structure and content they can range from a set of a few, quite fundamental principles, to long lists of principles that can be quite particular and sometimes are closer to the level of operational guidelines. For the purpose of the proposed sustainable development framework, it is intended that the principles to be slotted in at the level just below the 'values', should be fundamental principles with overarching validity, such as, for example, the principle of *holism*. These principles will be referred to here as *foundational principles*. Some of the other, more light-weight principles encountered in the literature will, in terms of the proposed framework, be inserted at a lower level and could be called, say, goals or subsidiary principles. The actual principles to be included in the framework are discussed later, in the next sub-section and also in Chapter 7.

At the following level of the proposed sustainable development framework one could slot in the so-called *dimensions* of sustainable development, and these would roughly be comparable to the so-called key result areas of a strategic planning model. Again, these dimensions of sustainable development will be discussed in much greater detail in the next chapter, but for the moment it may simply be reiterated that there seems to be a near unanimous agreement among the theorists that these dimensions should be (at least) those of the *natural* environment, the *social* environment and the *economic* environment, and hence it is provisionally these dimensions that are included in the framework.

At the next level of the framework *goals* are posited that apply to each of the previously mentioned dimensions. Obviously there could be many goals in each dimension, but for the

sustainable development framework being proposed here, it has been decided that one overarching goal in each dimension will suffice. These goals must be succinct answers to the question, “What is the main purpose to be realised in this dimension?” Based on the work of Meppem, *et al.* the following goals will be proposed here: in the dimension pertaining to the natural environment the suggested goal is that of maintaining *environmental integrity*, while in the social dimension it is that of enhancing *social cohesion*, and in the economic dimension that of ensuring *economic vitality or health* (2005: 157-158). It should be obvious that these dimensional goals are broad (maybe somewhat nebulous) ideals, and that their attainment thus is not so easy to describe. To make the outcomes more concrete, use may be made of a number of ancillary goals. These ancillary goals make up the next level of the proposed framework, but instead of calling them goals, they are, in line with previous discussions, here named *subsidiary principles*. The subsidiary principles are distinguished from the foundational principles occurring higher up in the framework, by their narrower areas of focus, which could allow one to categorise them, as a matter of convenience, under one of the respective dimensions.

In order to gauge the degree to which the above-mentioned principles are being applied in practice some form of *measurement* is needed. The saying that you can only manage that which you can measure, also applies to sustainable development. On a practical level, measurement involves the assessment, often in numerical format, of some or other *indicator*. For example, water quality may be assessed by means of an *E. coli* count.<sup>200</sup> There are many *indicators* used in the assessment of sustainable development, some more useful than others, some simple, some complex, some obvious and some debatable. Indicators may be of a very specific nature and of a very narrow applicability; taken singly they may not say much about sustainable development as a whole. Hence they are often collectively employed in groups to improve their validity in terms of sustainability assessment. On the other hand there are also compound indicators that have been developed to provide assessments that are more broadly valid. There are even some compound indicators that purport to measure sustainable development in a single index. More of these matters will be said later; for the moment, it need only be confirmed that it is the measurement of sustainable development, and sustainability indicators, that will fill the next level of the sustainability framework. As many indicators only apply to a single dimension

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<sup>200</sup> The *E. coli* count is a measure of bacterial pollution and is often indicative of the presence of faecal matter in the water.

of sustainable development, a dimensional categorisation will again be employed at this level.

As has been indicated above, the lower levels of the framework are more open to flexibility and particularity. At one of these levels one may find *guidelines*, which as their name suggests, could be (but not necessarily are) less imperative and more advisory in nature. Because a set of guidelines might be designed to address the full extent of sustainable development, it might not make sense to categorise the set under a single dimension, but it may well be that individual guidelines in the set could be grouped according to the dimensional categories. Given that many of the guidelines would typically apply to practice, the codes of conduct with respect to the environment and sustainability, as drawn up by the various professions, are examples of sets of guidelines that would fit in at this level of the framework. Of a more general nature would be the many publications giving so-called. “tips” for “greener living”.<sup>201</sup> While this latter type of general guidelines will receive no further attention in this study, a later chapter will be devoted to the discussion of environmental or sustainability codes of conduct, particularly as they may apply to the engineering professions.

Guidelines of a more formal kind are the policy and legal prescriptions around the environment and sustainability as they may apply in a jurisdictional area, be it a district, region or country. In South Africa, for example, environmental impact assessments (EIAs) are prescribed by NEMA, and also under the authority of this act guidelines have been produced that aim to facilitate the EIA process. A later chapter in this study will be devoted to a discussion of the environmental (and sustainability) policies and legislation as they exist in South Africa.

In terms of sustainability practice certain *methodologies* could also be found at the lower levels of the framework. These are in essence the ways of working towards sustainable development, and they could be quite technical and detailed, and used mainly by specialists in a field. They also obviously should not contradict any of the higher level values, principles and goals. Because of their specialist nature, sustainability methodologies will not be dealt with in any great depth in this study. Furthermore, for the sake of simplification these last two descriptors, guidelines and methodologies will be grouped together in the proposed framework under the

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<sup>201</sup> See Gear (2009).

more general heading of *applications*.

It is now possible to give a preliminary depiction of what the proposed sustainable development framework might look like. It is worth repeating that the sustainability descriptors are arranged in the depiction in a hierarchical order, with those at the higher levels being the broadly applicable, foundational tenets of sustainable development, while the more specific, more narrowly applicable and less prescriptive precepts are at the lower levels. The sustainable development framework, as it has been conceptualised thus far, is shown in Figure 5.1.

<b>SUSTAINABLE DEVELOPMENT FRAMEWORK</b>			
<b>DESCRIPTOR</b>	<b>DESCRIPTION</b>		
<b>Vision</b>	A sustainable society		
<b>Values</b>	Beneficence, fairness		
<b>Foundational Principles</b>	Holism, etc.		
<b>Dimensions</b>	The natural environment	The social environment	The economic environment
<b>Goals</b>	Environmental integrity	Social cohesion	Economic vitality
<b>Subsidiary Principles</b>			
<b>Measurement/ Indicators</b>			
<b>Applications</b>			

FIGURE 5.1: A SUGGESTED FRAMEWORK OF SUSTAINABILITY

It will be noticed that at the lower levels of the framework the dividing lines between the dimensions are broken. This is intended to indicate that a strict and water-tight separation of the issues into each of the domains of the various dimensions is not possible, nor even desirable. The holistic principle of sustainable development requires a cross-dimensional approach, and the dimensional categorisation is merely done for the sake of convenience. The framework as outlined in Figure 5.1 attempts to reflect the multi-faceted nature of the concept of sustainable development, as well as the full depth of its meaning. By following this approach

the need for a strict and accurate definition<sup>202</sup> of sustainable development is circumvented without compromising our understanding of the concept; in fact it might be claimed that by using the framework understanding is improved. While attempting to reduce some of the more critical ambiguities around sustainable development, the framework still allows space for adaptation as new insights are gained, or as new applications in specific fields are developed. The hierarchical structure built into the framework intends to lend some rigidity to the basic values and fundamental tenets of sustainable development found at the upper levels of the hierarchy, while allowing, at the lower levels, greater flexibility and more openness to accommodate specific nuances, emphases, cultural preferences and evolving techniques, without invalidating the structure as a whole. It is suggested here that this framework, when fully fleshed out, will be a very adequate vehicle with which to convey the full scope and depth of the concept of sustainable development.<sup>203</sup>

It is felt that the discourse on the first two levels of this proposed sustainable development framework, that of vision and values, has already been carried through to sufficient depth, and so what remains now is to present fuller discussions around the entries at the remaining levels. Following the order of the framework, the next sub-section will deal with the principles of sustainable development.

### **5.3.3 Principles of sustainable development**

The principles to be discussed in this sub-section serve the obvious purpose of further elaborating on the meaning and deepening the understanding of the concept of sustainable

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<sup>202</sup> What is meant here is the conventional type of definition that usually consists of a sentence or two.

<sup>203</sup> Along similar lines as the sustainable development framework discussed here, Ott speaks of the “spheres or layers of ... sustainable development” which he describes as:

- (1) Idea
- (2) Concepts
- (3) Guidelines
- (4) Dimensions
- (5) Management rules in single dimensions
- (6) Objectives
- (7) Indicators
- (8) Implementation (Ott, 2003: 59).

Burger and Mayer (2003: 10) present the following hierarchy:

Vision → Guidelines or principles → Operational goals/standards → Action directives.

development. In this sense they not only represent ideals for the ways in which society should order its affairs, but in some cases also imperatives that humanity can only ignore at its own peril. From a legal perspective they should inform not only national legislation and policy, but also, more universally, the international concerns, agreements and treaties which collectively form the basis of international environmental law, and which should guide such international interactions as global trade (OECD, 1995: 4-5).

A *principle* can be defined as “a fundamental truth or law [to be used] as the basis of reasoning or action” or also as (in the plural form) “rules of conduct”.<sup>204</sup> It thus appears that a principle can vary in interpretation from a theoretical truth to a practical rule. In this light the principles to be discussed in terms of the proposed sustainable development framework (see Figure 5.1) will be categorised into two levels; where the principles on the higher level will be more fundamental and of more universal application, and those on the lower level less foundational, more narrow in focus and more directly applicable to practice. These two categories of principles have been designated in the proposed sustainability framework as foundational and subsidiary principles.

In literature one can find many sets of principles that have been put forward in an effort to better elucidate the concept of sustainable development.<sup>205</sup> It might be prudent thus to heed the following caveat of Caldwell:

The imprecise and diverse interpretation of what the contextually-hyphenated term “sustainable development” means makes it difficult to draft principles that are universally applicable and useful. No set of principles, however reliable, can cover all contingencies. (2001: 1741)<sup>206</sup>

To some extent, Caldwell’s reservation is addressed by the dual categorisation of the sustainable development principles into foundational and subsidiary principles, and the authority associated with the position of these categories in the hierarchical order of the

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<sup>204</sup> *Reader’s Digest Oxford Complete Wordfinder*, 1993. London: Reader’s Digest Association Limited.

<sup>205</sup> The International Institute for Sustainable Development lists more than a hundred sets of principles. Available at <http://www.iisd.org/sd/principle.aspx>. [Accessed on 12 March 2013]

<sup>206</sup> This is not say that there might be a few very fundamental principles that come close to the level of master principles.

framework. In order to provide further authenticity to the principles that will eventually be included in the proposed framework, a review will be made of a number of sets of principles encountered in the literature. It was found in this literature search that a number of principles were common to many of the various sets of principles out there. It was also evident, however, that in many instances these suites of principles reflected the predilections of their compilers. For example, sets of principles drawn up by natural scientists and environmentalists tended to reflect a leaning towards the *natural environment*, while other sets, emanating from the ranks of social scientists and economists were more inclined towards the *socio-economic environment*. In the review of principles which is to follow, examples were chosen which loosely reflect, *inter alia*, these two mentioned perspectives. In addition, two further broad categories that were applied in the review were those that reflected *national* priorities, and then also those that emanated from *international conferences*. It should be understood that this categorisation of the various sets of principles is not of fundamental significance in itself, other than attempting to ensure that a broad spectrum of nuanced perspectives were included in the review. And so, in each of the four broad categories mentioned above, three or four example sets of principles were chosen for the review, with the overall objective of extracting from them those principles which can be considered to be the most fundamental and universal. All the chosen exemplar sets of principles are reproduced in appendices attached to this report. (See Appendices C1 to C13.) It should also be noted that as full discussions of each of the various sets of principles would inevitably entail a lot of repetition, a more compact approach will be followed here; the discussions will progressively become leaner as, in the latter stages of the review, the focus shifts more towards the differences rather than repeating the commonalities emerging from the various sets of principles.

#### 5.3.3.1 Principles with a (presumed) inclination towards the natural environment

##### (a) The *Caring for the Earth* principles

The first exemplar set of principles to be discussed in this category are those appearing in the publication *Caring for the Earth* (IUCN, UNEP & WWF, 1991). This publication, subtitled *A Strategy for Sustainable Living*, was produced under the auspices of a partnership consisting of the World Conservation Union, the United Nations Environment Programme and the World Wide Fund for Nature. Being championed by such a significant (in environmental circles)

partnership, these principles must perforce enjoy considerably standing,<sup>207</sup> and they would also, one would expect, reflect a perspective favouring the natural environment. This suite of principles is reproduced in Appendix C1.

In *Caring for the Earth* these principles are described as those characteristic of a *sustainable society*, and as the concept of a sustainable society was posited as the vision which anchors the sustainable development framework being proposed in this study, these principles would seem to be particularly appropriate here. (It might be noted at this stage that while the set of principles presently under discussion are described as those for a sustainable society, in some of the other reviewed suites, the principles are described as those required for *sustainable development*, for a *sustainable way of life*, for *sustainability*, and so on. These differences do not appear to be fundamentally significant and hence should not detract too much from the present objective of trying to identify the main principles of sustainable development.)

In the preamble to the set of principles from *Caring for the Earth* it is stated that they are needed because:

- the most important issues we face are strongly interlinked, and therefore our actions must be mutually supportive and aimed at a common goal;
- the changes we must make in the ways in which we live and develop will be fundamental and far-reaching: they will demand our full dedication. The task will be easier if we work together;
- no single group can succeed by acting alone. (IUCN, UNEP & WWF, 1991: 8)

Underlying this statement there appears to be what, in this study, has been suggested as a foundational principle of sustainable development; that is the principle of *holism*. While this principle has not been explicitly articulated as such in *Caring for the Earth*, it will be presumed to be part of this set of principles, being read to be implicit in the preamble to these principles. (It may be noted that the principle of holism will, because of its considered importance, be extensively revisited in a later chapter.) For the moment though, attention will be focussed on the nine principles of a sustainable society which, in *Caring for the Earth*, follow on after the above preamble.

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<sup>207</sup> This is borne out by the many times reference is made to them in the literature.

### 1. Respect and care for the community of life

This can be regarded as the ethical basis for the remaining eight principles that are to follow and it enjoins us to treat life with reverence. This does not only concern other people living at present, but also future generations, and then also all other forms of life. While the *biocentric ethic* is clearly evident in this opening principle, it is also stated that even the non-living components of the planet<sup>208</sup> need to be considered, as these, together with the living, form one great interdependent system – the holism principle again.

The next four principles are considered as essential criteria for a sustainable society.

### 2. Improve the quality of human life

The aim of development, and thus by implication also of sustainable development, is to improve the quality of human life. This means that people should not be deprived of their dignity as human beings. And that in turn means that they should have access to those universal human rights that define human dignity, which include health, education, a decent standard of living, free political expression and freedom from violence. The improvement of human lives in all these respects cannot be less than an inherent objective of sustainable development, given the social perspective it acquired in the WCED deliberations.

### 3. Conserve the earth's vitality and diversity

It has been cogently argued<sup>209</sup> that the well-being of society depends, in a critical sense, on that which nature provides, and hence sustainable development cannot avoid being fundamentally concerned about the protection of the world's natural systems.<sup>210</sup> This will require, *inter alia*, that the ecological services of nature, which allow the earth to support life, be conserved. These services include the natural processes of self-cleansing and renewal as found in the atmosphere, the water bodies and the soil systems of the earth. It is furthermore also necessary to protect the

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<sup>208</sup> The *integrity* of Leopold's biotic community (1966: 262) is compromised if the non-living components of the planet are not taken into consideration.

<sup>209</sup> See for example Daly (1991b).

<sup>210</sup> This anthropocentric view may seem to deny the intrinsic value of nature, but the pragmatist will argue that it is the protection of nature that counts irrespective of whether this is done from an anthropocentric or an ecocentric perspective.

biodiversity of the earth, and not to use renewable resources beyond their capacity for regeneration.

#### 4. Minimize the depletion of non-renewable resources

Resources, such as fossil fuels, which have very low regenerative capacities – far below their levels of use – are termed non-renewable resources, and in effect their use is unsustainable. Thus it is necessary that the use of non-renewable resources be minimised as far as it is possible by, for example, recycling or by turning to renewable substitutes. And so, while future generations might in the long run be deprived of these resources, it is the intention that there should be, by that time, suitable alternative means or practices. It is thus incumbent upon the present generation to invest sufficient resources into the development of these alternatives.

#### 5. Keep within the earth's carrying capacity

While this principle in effect summarises the previous two, it does specifically, highlight the finitude of the earth, and hence that the growth in human numbers and the profligate use of resources by humans cannot continue as if there are no limits. Policies should be put in place which not only manage the use of resources prudently, but which also address human population growth and consumerist lifestyles.

The last four principles suggest approaches that should be followed on the individual, local, national and international levels.

#### 6. Change personal attitudes and practices

Clearly people need to adopt values that promote sustainable lifestyles.<sup>211</sup> These values need to be inculcated through formal and informal education, so that policies and actions aimed at promoting sustainable development are not only understood, but are also promoted and endorsed. The wide-spread concern about threats to the environment as a result of unsustainable practices, which implies a much needed change (a radical change in the view of many) in societal attitudes, reinforces the importance of this principle, yet it is noticeably absent, in explicit form, from the other sets of principles reviewed. However, the mere fact that sets of

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<sup>211</sup> As has been previously noted many environmental theorists feel that change towards sustainability is not possible without a fundamental change in attitude, variously called a change in world-view or a paradigm shift.

principles for sustainable development are being produced might be taken as evidence of a perception of the need for a change in the attitude of society towards the environment. The same argument may be applied to all of the many exhortations and initiatives around the theme of sustainable development. So one can assume that this principle, even if in unwritten form, is a necessary corollary of any set of sustainable development principles. Using the same reasoning, it will also be presumed that this principle is implicit in the rationale of the sustainable development framework being proposed in this study.

#### 7. Enable communities to care for their own environments

Communities and local groups provide the easiest channels for people to express their concerns and take action to create securely-based sustainable societies. However, such communities need to be empowered by authority and knowledge. Groups or communities so empowered, can be an effective force for sustainability whether their community is rich, poor, urban, suburban or rural.

#### 8. Provide a national framework for integrating development and conservation

The functioning of a country is facilitated through a framework of law, policies and institutions. A national programme aimed at achieving sustainability should integrate all these societal resources, and because of the evolving understanding of sustainable development such a programme must be adaptive and sensitive towards new experiences, needs and insights. In effect what is being called for is effective governance that converts the principles of sustainable development from theory into concrete actions. The notion of integrated environmental management (IEM), and the procedures flowing from it, have been well documented in South Africa, and are increasingly being extended, adapted and implemented in SA law and policy (DEAT, 2004a). Thus, for example, South African law (NEMA) now prescribes that no significant development can proceed unless all its environmental impacts have been assessed and taken into account.

#### 9. Create a global alliance

Sustainability in the last instance needs to be effected globally as many environmental issues are not limited by national boundaries. Nations share common resources such as the atmosphere, the oceans and river systems, and they are furthermore economically linked

through trade, an increasingly mobile workforce, and international travel and tourism. Many environmental problems have international ramifications. McKinlay, drawing on Burger, articulates these problems as follows:

Sustainable development is jeopardised by a vast number of problems that are a common concern of all societies, namely: mass poverty, environmental degradation and climate change, migratory movements, population growth, spreading of contagious diseases, uncontrolled nuclear potentials, aggressive religious fundamentalism, ethnic fragmentation, problems of national debt and international trade, drug trafficking and international crime. (2004: 43)

Given that all of these problems can have international implications, sustainability will only be realised if a common purpose, expressed in multilateral co-operation and agreements between countries, prevails. In respect of common environmental resources and problems no nation is an island, and all “nations stand to gain from a worldwide sustainability – and are threatened if we fail to attain it” (IUCN, UNEP & WWF, 1991: 12). The notion of common but differentiated responsibilities also applies in the international arena. Powerful countries need to shoulder their extended responsibilities and furthermore need to support those countries less developed or more poorly endowed.

The *Caring for the Earth* principles have been discussed in some detail as they are not only the introductory set of principles to be discussed in this sub-section, but they also succinctly cover many of, what will turn out to be, the more common principles which will eventually be incorporated into the proposed sustainable development framework. However, it may be argued that in this set of principles economic issues and the imperatives of business are somewhat lightly treated, if not ignored. And this is perhaps not unexpected, given that the *Caring for the Earth* principles were articulated by an environmental alliance who might habitually be inclined to favour the concerns of the natural environment. However, as has been previously stated, this reservation will hopefully be overcome by reviewing, in sub-sections still to follow, sets of sustainable development principles that respectively originate from the business, national and international environments. But before these sets are considered, it is first back to the next exemplar set of principles (with a presumed environmental flavour) in this sub-section.

(b) *The Earth Charter* principles

The second set of principles included in this review, are collectively known as *The Earth*

*Charter* (Earth Charter Initiative, 1999; Lubbers & Morales, 2001: 1921-1922). Involving, as it does, sixteen principles in all, together with its elaborative statements, it appears, at first, more comprehensive than the previous set, but then a closer scrutiny reveals a tendency towards repetitiveness and perhaps excessive detail. This more elaborate format might be a result of the extensive consultations that took place prior to and during its drafting process, and which, it is claimed, adds greatly to *The Earth Charter's* legitimacy. From its website one reads:

The Earth Charter is a product of a decade-long, worldwide, cross cultural dialogue on common goals and shared values. The Earth Charter project began as a United Nations initiative, but it was carried forward and completed by a global civil society initiative ...

The drafting of the Earth Charter involved the most inclusive and participatory process ever associated with the creation of an international declaration. This process is the primary source of its legitimacy as a guiding ethical framework. The legitimacy of the document has been further enhanced by its endorsement by over 4,500 organizations, including many governments and international organizations.<sup>212</sup>

*The Earth Charter* principles are reproduced in Appendix C2, and on their website they are described as a set “of fundamental ethical principles for building a just, *sustainable* and peaceful global *society*” [emphases added], which corresponds to the objective of the *Caring for the Earth* principles, and importantly also with the previously discussed and accepted vision of the proposed sustainable development framework. While again not explicitly mentioned, the principle of holism may again be found to be implicit in *The Earth Charter* principles, more specifically in principles 1, 4, 6, and 16, and in their respective subordinate components.

*The Earth Charter* principles are divided into four sections. The first section, headed “Respect and care for the community of life”, reveals explicit evidence of the *biocentric ethic* that underlies these principles, and they can be considered, in similar fashion to the *Caring for the Earth* principles, to be the ethical foundation of the principles to follow. While the remaining three sections of *The Earth Charter* are broadly focussed on the respective *dimensions* of sustainable development, it is once again evident that these dimensions are not interpreted as mutually exclusive. Some principles, here included under one dimension, might be considered by others to be equally, if not more, pertinent to another dimension. But notwithstanding this

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<sup>212</sup> Available at <http://www.earthcharterinaction.org/content/pages/What-is-the-Earth-Charter%3F.html> [Accessed on 1 June 2010]

observation, one finds that the second section of *The Earth Charter* principles, headed 'Ecological integrity', essentially addresses the environmental dimension, while the third section which has a socio-economic focus could be representative of the social and economic dimensions. Most of the principles in the fourth section are representative of what later will be called, the institutional dimension.

As is to be expected, many of the emphases manifest in the *Caring for the Earth* principles are also evident in *The Earth Charter*. But, in addition, the latter also accentuates inter-generational equity (principle 4), human rights and anti-discriminatory prescripts (principles 7 and 12), poverty elimination (principle 9), gender issues (principle 11), and technology transfer and education (principles 8 and 14).

(c) The LWF principles

The third set of principles (LWF, 2000) to be reviewed here are reproduced in Appendix C3. They could hardly be said to spring from an environmental background, being issued, as they are, by the Lutheran World Federation (LWF), a global communion of Christian churches in the Lutheran tradition. Thus it is stated that the

commitment of the Lutheran World Federation to sustainable development, ... is grounded in and shaped by the faith Christians confess ... [which avers *inter alia* that] God created all that is – the cosmos, the environment, all creatures, plants, and human beings – in an interdependent web of life. And “it was very good” (Genesis 1:31). Matter and spirit, nature and culture, all of creation is the arena in which God is both hidden and revealed (Luther). (LWF, 2000: §10)<sup>213</sup>

As has been said, the LWF principles (as they will be designated here) can hardly claim to have an environmental perspective, but they do go some way in softening and countering the arguments, made by Lynn White (2003) (see Chapter 2), of Christian complicity in environmental destruction. Also their social orientation (as will be highlighted here below) might suggest that they should rather have been included in the next grouping of sets of principles, still to follow. However, as has been said, these groupings are not watertight compartments, and it was the 'canonical' orientation<sup>214</sup> that they share with the two sets of

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<sup>213</sup> The numbers used in the citations refer to the paragraph numbers used in the original document, and are not to be confused with the numbers given to the principles in Appendix C3.

<sup>214</sup> That is to say their focus on fundamentals.

principles already reviewed, which prompted their inclusion in this sub-section. (Another reason for their inclusion in the review at all, is that they are the only set that can be said to spring from a religious source.)

From the preamble that introduces the LWF principles one may anticipate their strong social tenor. Their central focus on humans, and also, their future perspective emerges from the fact that they are:

founded upon an understanding of sustainable development as a process of change by which the basic needs and human rights of individuals and communities in any given society are realized while at the same time protecting the basic needs and human rights of other communities and future generations. (LWF, 2000: §2)

Thus it comes as no surprise that of the five categories into which the LWF principles are grouped, three are focussed on social issues, they being designated as the *human rights*, the *gender* and the *communications dimensions*. The focus of remaining two categories, those of the *general principles* and the *environment dimension* are self-evident. From this categorisation it is not to be assumed that the economic and the institutional<sup>215</sup> dimensions have been ignored; indeed many of the principles listed in the given categories do in fact address these dimensions. This underlines again that the dimensional categories accorded to sustainable development are not to be seen as mutually exclusive.

The fact that the first of the general principles of the LWF deals with holism seems to suggest that for the LWF too, holism is a fundamental principle. As expected from the reading of the preamble, many of the general principles address some or other aspect of the human condition, such as the areas of human dignity and well-being, health, education, peace and reconciliation, all of which confirm the leaning of the LWF principles towards social issues. In addition by highlighting the issues of traditional governance, appropriate technology, community assets, cultural sensitivity, equity, empowerment and participation, the LWF also demonstrates a special regard for the rights of less developed communities. The importance of sound and stable financial and institutional structures as necessary conditions for sustainable development is also recognised.

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<sup>215</sup> These are dimensions which feature strongly in the discussion on dimensions in Chapter 6.

Obviously all the principles listed in the human rights section deal with this topic, and in general require human rights to be respected, upheld and promoted. Human rights are considered integral to sustainable development. Principle 19<sup>216</sup> asserts responsibilities as a corollary of human rights, an issue not infrequently omitted in human rights documents. Principle 21 addresses religious freedom, and children's rights are covered in principle 27. The principles listed under the gender dimension, deal essentially with the human rights of women, with particular reference to the disadvantaged position women often find themselves in. The empowerment of women and their full participation in development work is called for. It is also asserted that sustainable development cannot be gender-neutral.

The section on the environment dimension includes, as can be expected, (although not worded as such) the carrying capacity principle. There are also principles that cover the need of the environment to be considered in all development activities, and that prescribe that humans should assume stewardship of nature. The environmental justice principle calls for equity in terms of access to, management and use of natural resources. Local and international economic interests are to be linked to environmental commitment. Principles 45 and 46 highlight the links between sustainable development and environmental education, environmental awareness and the use of indigenous knowledge. In the last section one finds principles that address the importance of communication in sustainable development – the need for effective communication using appropriate methodologies and making maximum use of traditional forms of communication. Lastly, principle 53 calls for the building of networks within and between communities.

A practical criticism that may be raised against the LWF principles may be their length. This is a very obvious difference between them and the sets of principles that have already been reviewed – the LWF set comprises 53 principles as against the 9 of the *Caring for the Earth* set and the 16 of *The Earth Charter* set. The lengthiness of the LWF principles results from a general wordiness, repetition and overlap. There is probably always, in documents such as these, some tension between succinctness and comprehensiveness, but the guideline followed in this study is that a fewer number of broad principles, succinctly stated, carries more impact

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<sup>216</sup> The principles are referred to by using the numbers which are allocated to them in Appendix C3.

than lengthy, verbose articulations. Objection may also be raised against the strong social bias evident in this set of principles, but there are many other sets of principles which place human beings at the centre of sustainable development,<sup>217</sup> and the LWF principles are no exception in this regard. It is not unreasonable to conclude that for many organisations and agencies, sustainable development without a strong social orientation is not only inadequate, but also unacceptable. Be that as it may, the social emphasis in the LWF principles provides a good transition to the next grouping of sets of principles which emanate primarily from a socio-economic background.

#### 5.3.3.2 Principles stemming mainly from a social/economics background

In the modern era many organisations in the business/economic arena take their social (and environmental) obligations seriously, and it is from these that three were selected to represent the social/economics perspective for this review. As could be expected with sets of sustainable development principles emanating from such a broad ranging group, greater levels of disparity (compared to the previous grouping) are apparent between the different sets of principles. For example some sets of principles reflect a bias towards the *management* of sustainability issues (See IoDSA, undated; IoDSA, 2009; ICC, undated; Sigma Project, undated; Ecolab, 2007), while in other cases the focus falls on *environmental* sustainability<sup>218</sup> (see Ceres, undated.), and in yet others, on the company's area of operations (see Ecolab, 2007). Given this variation in focus, the selection of the sets of principles to be included in this review is inevitably somewhat subjective and arbitrary.

##### (a) The GTZ principles

The first set of principles to be reviewed in the social/economics grouping are those that have been developed within the operating environment of the *Deutsche Gesellschaft für Technische Zusammenarbeit*, and they are here designated as the GTZ principles (Burger, 1997: 8-17; Burger & Mayer, 2003: 15-31). At first sight these principles appear quite different in style and content, compared to say the *Caring for the Earth* principles. However, deeper analysis will reveal many fundamental correspondences with the previous sets, which confirms again the

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<sup>217</sup> The anthropocentric bias in NEMA has already been mentioned.

<sup>218</sup> In business circles environmental sustainability may appear under a company's corporate social responsibility (CSR) policy, possibly reflecting a social leaning (Blackburn, 2007: 5).

feeling that there is, in general, a reasonable consensus around the main principles of sustainable development. The GTZ principles derive their rationale from the well-known *Agenda 21*,<sup>219</sup> a broadly negotiated and widely recognised UN document.

In attempting to distill the “essence” of the *Agenda 21* message from the volume and complexity of the *Agenda 21* documentation, Burger and Mayer suggest that it can be captured in five principles. Burger indicates that these principles, here called the GTZ principles, are aimed at filling the gap “between vision and strategy”, in other words between theory and practice. This is in accord with the hierarchy of the proposed sustainable development framework, which also slots principles in somewhere between vision and practice (see Figure 5.1). For Burger and Mayer the vision is sustainable development itself, and in particular, its three-dimensional constitution as it emerged from the Rio Summit. They state that:

the vision of sustainable development ... must always take into account the social, economic and ecological dimensions. The economy, the environment and society are inseparably linked. (Burger & Mayer, 2003: 11)<sup>220</sup>

And then, having defined their vision, they affirm that the sustainable development “principles are the structural elements, the basic rules of [this] vision” (Burger & Mayer; 2003: 10). Their principles are illustrated in summary form in Figure 5.2, and are also more fully reproduced in Appendix C4.

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<sup>219</sup> Agenda 21 is a blue-print for sustainable development that was an outcome of the Earth Summit held in Rio de Janeiro in 1992.

<sup>220</sup> Burger and Mayer use a 2001 publication of the International Institute for Environment and Development (IIED) named, *The Future is Now*, as their reference.

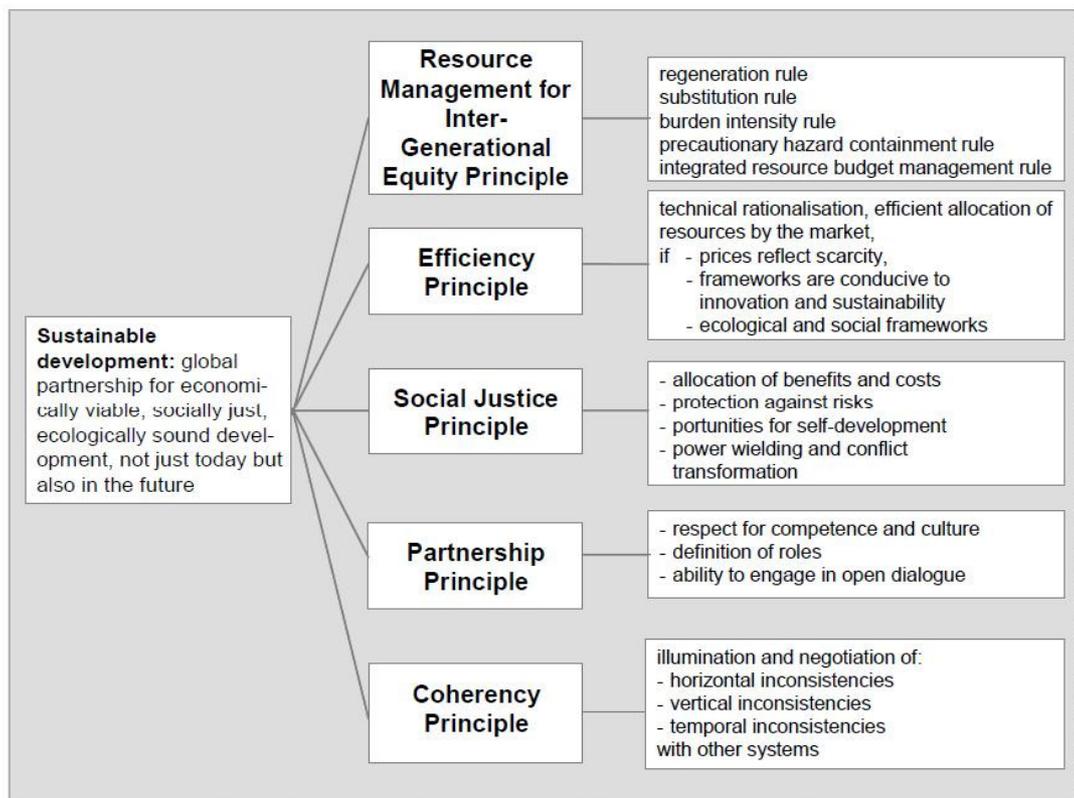


FIGURE 5.2: THE GTZ PRINCIPLES OF SUSTAINABLE DEVELOPMENT  
(From Burger & Mayer, 2003: 19)

It is interesting to note that Burger and Mayer make the point that their five principles should in general be applied to *all* three of the dimensions that constitute their vision of sustainable development. It is suggested here that this approach is rather artificial and forced, and that the principles would naturally tend to find more applicability in one (or maybe two) dimension(s) rather than in all three. Resource management, for example, resides comfortably in the environmental dimension. Hence it is accepted in the discussion of the GTZ principles here below, that they and their sub-principles will find a natural home in one (or maybe more) of the sustainable development dimensions.

#### 1. The resource management for inter-generational equity principle

According to Burger and Mayer this principle requires us

to conserve the resource base of future generations, so that a capital stock is available to them in the form of a resource base which, although not identical to the resources on hand today, is nevertheless of equal value. (2003: 19)

In other words “future generations should be at least as rich in opportunities as the present

generations”, and hence this principle can be “understood as securing resources for the future” (Burger, 1997: 8). This principle arose out of the need felt to manage our natural resources more sustainably, and it can be further explicated through a number of sub-principles or rules:

- the *regeneration* rule which limits the extraction of renewable resources to the rate at which they can be regenerated,
- the *substitution* rule which requires that the rate of use of non-renewable resources be limited by the rate at which suitable substitutes can be developed,
- the *burden intensity* rule which requires that waste emissions be less than the assimilative capacities of the environment,
- the *precautionary hazard containment* rule, known more generally as the precautionary principle, which insists that the lack of full scientific certainty should not be used as an excuse to postpone the necessary steps being taken to prevent environmental degradation, and
- the *integrated resource budget management* rule which simply requires that regular budgeting exercises be carried out in order to ensure the resources stocks are not being run down.

## 2. The efficiency principle

This is a standard economic principle that requires resources to be used as efficiently as possible. It requires, in Burger’s words, “utilizing available resources such that a certain utility is achieved with minimum input or such that a certain input delivers maximum utility” (1997: 11). In economic practice this principle is effected through the free market system where competition ensures efficiency and innovation. However where prices and competition are distorted, as they may be by externalities, subsidies and incomplete information, the market fails to ensure efficiency. This is often the case with natural and social resources. And even if the market is undistorted, efficiency by itself does not mean that social and ecological goals are met. These have to be negotiated separately. Daly characterises this triad of efficiency, social

and ecological goals, as the problems of *allocation*, *distribution* and *scale*. Using tradeable pollution permits as an example, he asserts:

It is clear that scale is not determined by prices, but by a social decision reflecting ecological limits. Distribution is not determined by prices, but by a social decision reflecting a just distribution of newly created assets. Subject to these social decisions, individualistic trading in the market is then able to allocate the scarce rights efficiently. (1996: 53)

Burger and Mayer concur:

Only in conjunction with the other principles, and in particular only when controlled by consensual, negotiated systems of [social and ecological] objectives, can the efficiency principle help bring about sustainable development. (2003: 22)

### 3. The social justice principle

This principle requires that the benefits and costs of resource use be fairly distributed among all social groups concerned. Of particular concern here are the poor and disadvantaged. Due to their status in life they are often denied access to resources, information and opportunities. They are also excluded from decision-making processes and receive little protection against risks. These shortcomings need to be addressed, and this also requires recognition of the power wielded by various interest groups, including the wealthy. Implied too is the management of conflict that may arise between competing groups. In this regard good governance, which includes the application of administrative justice, respect for community rights, and management of the North/South disjunction, is essential. By alluding to the political preconditions for development, such as accountability, transparency, the rule of law and the stemming of corruption, as set out by the World Bank and others, one may conclude that Burger and Mayer have subsumed these principles under their social justice principle.

The compelling problem of poverty is a critical issue of social justice. According to Burger and Mayer it

can jeopardise not only social justice, but also all the other principles of sustainable development. Consequently, poverty alleviation is pivotal to sustainable development. (2003: 24)

Allied to the problem of poverty is the issue of responsible consumer behaviour, which rests, in the main, on the shoulders of the developed world. The prodigious and wasteful consumption patterns evident in these societies pay little heed to a need for frugality, otherwise also termed

the principle of sufficiency. Overconsumption is the antithesis of sustainable development.

#### 4. The partnership principle

Partnerships include those between states, sectors of society, and individuals, and they can be formal or informal. Burger and Mayer contend that “[w]ithout partnerships, the changes necessary for sustainable development can neither be brought about, nor can those that have been achieved be maintained” (2003: 25). For partnerships to be enduring there should be mutual respect for the expertise and cultures of the respective partners. There should furthermore be a clear understanding around the roles of each of the partners and a willingness to participate in open and honest dialogue.

#### 5. The coherency principle

Burger draws an analogy between this principle and the central nervous system of our bodies, which integrates the many functions of the body, detects incompatibilities and promotes adaptations to overcome these incompatibilities. The coherency principle is a fundamental principle in that it represents the “hub of sustainable development”, of which “the ultimate long-term aim ... is to harmonise the sub-system of human economic activity with the overarching system ‘earth’” (Burger & Mayer, 2003: 26). In order to explain practical implications of this principle Burger and Mayer offer the following exposition:

Sustainable development is a holistic concept that embraces all spheres of human life. However, this holistic aspiration conflicts with the limited human capacity for coping with complexity: people are only able to perceive and address sub-systems, which are segments of the whole. They are then at risk of mistaking the part for the whole (reductionism), and of overlooking the interrelationships between the sub-system and its ambient system ...

One way out of the dilemma created by the fact that holistic perception is impossible, and reductionism dangerous, is offered by a constant switch of perspectives. This ... repeated switch of focuses ... must take various directions: to the right and left to the adjacent sectors, in order to check horizontal consistency, upwards and downwards to the supra- and subordinate planning and activity levels, in order to ensure vertical consistency, and also backwards and forwards to the past and the future, in order to check ... consistency across time and compatibility with tradition(s). (2003: 27)

The principle of coherency is thus nothing but the principle of holism with special reference to interdisciplinary and spatial integration (horizontal coherency), institutional integration

(vertical coherence) and consistency over time (temporal coherence). In short it aims at consistency and compatibility between the various dimensions of sustainable development including its future perspective. This study concurs with the foundational importance accorded to the holism principle and will, in a later sub-section, deal more fully with it.<sup>221</sup>

(b) The ICMM principles

Another set of principles originating in a business environment are those which represent the views of the International Council on Mining and Metals, here called the ICMM principles (ICMM, 2003). The ICMM principles are reproduced in Appendix C5. Whereas the GTZ principles reflect the perspective of a development agency, albeit in a technical sphere, the ICMM principles present more of a business perspective. This could perhaps explain why the first principle (out of ten) deals with corporate governance and ethical business practices, and why the first explicit mention of the environment is only in Principle 6. While it might be unfair to read too much into this order of the principles, the general business slant of these principles is also reflected in the mention of issues around staff and customers, risk management, health and safety considerations and product life cycles. This is not to imply that these principles are in some way inferior to the other sets of principles; it simply affirms that *all* sets of principles, to a larger or lesser degree, reflect the predilections of their authors. In fairness it must be said that sustainable development is very clearly and prominently featured as the second principle of the set:

2. Integrate sustainable development considerations within the corporate decision-making process.

- Integrate sustainable development principles into company policies and practices.
- Plan, design, operate and close operations in a manner that enhances sustainable development [etc.] (ICMM, 2003:2)

Overall the ICMM principles are also probably closer to what in business circles would often be referred to as ‘corporate social responsibility’.

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<sup>221</sup> See §7.1.1.

(c) The OECD principles

A third set of principles in the socio-economic category to be reviewed here, designated as the OECD principles, were issued by the Organisation for Economic Co-operation and Development (OECD, 1995), and they may be found in Appendix C6. According to their website, the:

OECD brings together the governments of countries committed to democracy and the market economy from around the world to:

- support sustainable economic growth
- boost employment
- raise living standards
- maintain financial stability
- assist other countries' economic development [and]
- contribute to growth in world trade.

The Organisation provides a setting where governments compare policy experiences, seek answers to common problems, identify good practice and coordinate domestic and international policies.<sup>222</sup>

Some might argue that the commercial and trade orientation of the OECD reduces their environmental credentials, as is maybe evidenced in the organisation's commitment to "sustainable economic growth", on face value an oxymoron<sup>223</sup> that has already been critiqued in this study. The following discussion will hopefully confirm that this pre-judgement is not really justified, and that they do, in fact, add value to this review of principles, not only by virtue of their perspective and content, but also by virtue of the economic strength that they represent, and their co-operative stance.

The original OECD document, under the general heading of *environmental* principles, groups its principles into separate sections dealing respectively with *sustainable development*, the *polluter pays*, and the *precautionary* principles. This categorisation runs counter to the type of groupings that most of the other exemplar sets of principles have employed. For example, the environmental principles would normally be subsidiary to the sustainable development principles, as would be the polluter pays and precautionary principles. Thus, for the purposes of this review, the OECD groupings will largely be ignored (other than for descriptive

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<sup>222</sup> <http://www.oecd.org> [Accessed 12 June 2008]

<sup>223</sup> Economic growth usually implies ever greater material throughputs, which in a world of limited resources is simply not sustainable.

purposes), and all the principles will simply be considered to be part of an enlarged suite of sustainable development principles. This is justified on the grounds that, as has already been mentioned a number of times, the groupings (dimensions) are in any case not considered to be fundamental or mutually exclusive.

The first principle in the OECD document, the so-called *sustainable development* principle, contains a number of subsidiary clauses each of which, in other sets of sustainable development principles, would merit a separate principle in its own right. These include the principles of holism, carrying capacity, equity, transparency, participation and biodiversity conservation. The OECD's *ecological interdependence* and *intergenerational and intragenerational equity* principles can be seen as nuanced interpretations of the holism principle. The remaining principles in the first section of the OECD's set have a pronounced international flavour dealing, as they do, with international obligations and responsibilities with respect to transboundary resources and pollution and the global commons.

The second section of the OECD principles generally applies to the use and abuse of environmental resources. The *polluter pays* principle requires that those responsible for pollution should bear the cost. On the basis of this principle and the *common but differentiated responsibilities* principle one could, in the case of global warming for example, justify the more stringent obligations placed upon the developed countries, in view of their greater contribution to this problem. The *user pays principle* simply extends the thinking behind the polluter pays principle to the use of all environmental goods. The *internalisation of external environmental costs* is an attempt to establish and include the real cost of environmental goods into the economic realm.

The last section of the OECD principles revolves around the *precautionary principle*. This principle does not accept scientific uncertainty as a sufficient reason for delaying the measures that need to be taken in mitigation of predicted environmental impacts. The *pollution prevention* principle requires that pollution be prevented (or minimized) in preference to end-of-line treatment. Other principles mentioned in this section, *risk assessment*, *critical load*, *life-cycle assessment* and *environmental impact assessment*, are often simply techniques that are included under a broader conceptualisation of integrated environmental management.

Despite being somewhat dated, the OECD principles can, as it were, be taken as the perspective of the industrialised countries on sustainable development principles. It is appropriate then at this point to move on to those sets of sustainable development principles that have a national perspective.

#### 5.3.3.3 *Principles with a national orientation*

The common factor in the third grouping of sets of sustainable development principles to be reviewed here, is their national orientation. Their sources vary from national advisory bodies to the official policies and legislation of a country. As such it can be expected that they might place emphasis on issues which are of particular importance to the country of origin. On the other hand, the premise of this reviewing exercise, that broad commonalities will emerge from the various sets of principles reviewed (commonalities which can be coalesced into a single suite of principles of general validity) still stands.

##### (a) The *Comhar* principles

The first set of principles to be reviewed in this category is the suite developed by the *Comhar*<sup>224</sup> Sustainable Development Council (SDC) in Ireland (Comhar, undated). The *Comhar* SDC draws its members from various sectors in the Irish society and they operate as a stakeholder organisation that assists the Irish Government in the implementation of sustainable development.

Some of the *Comhar* principles, of which there are twelve in number (grouped into seven themes) may appear quite specific and therefore somewhat less fundamental than may generally be the case for many of the principles in the other sets of principles reviewed. For example, *Comhar* Principle 4 calls for the quality of soil and water resources to be maintained and improved, and yet it might be argued that these resources are but yet part of the broader category of all natural resources, which are in any case dealt with elsewhere in the set of principles. But it is important not to lose sight of the so-called themes into which the *Comhar* principles are grouped, and which in themselves may be interpreted as principles of a more over-arching and fundamental nature. Thus, in Appendix C7, where the *Comhar* principles have

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<sup>224</sup> *Comhar* is the Irish word for partnership

been reproduced, the themes have been lettered to facilitate their inclusion in the following discussions and in the final summary.

It might also appear that the economic dimension of sustainable development is less prominent in this set of principles, while principles dealing with environmental and social dimensions feature strongly. However, it should be noted that the concepts of efficiency and equity, which appear in the themes A, B, D and E, are basic economic concepts. In addition, one will find the three-dimensional nature of sustainable development being emphasised quite strongly in the preamble to these principles, with the caution added that the neglect of any *one* of these dimensions would “undermine the system as a whole” (Comhar, undated: 3). In other words the economic dimension is considered on par with the other dimensions.

While holism is not specifically mentioned as a principle in this suite, it is evident from the preamble to these principles that, once again, there is strong emphasis on the integration of the dimensions of sustainable development. According to *Comhar* “sustainable development must encompass environmental protection, economic development, and social development in an integrated manner” (undated: 2). Thus, by implication, the principle of holism is again endorsed.

Being a national set of principles one should not be surprised to find themes of *equity between countries and regions* and *good decision-making* included in this suite of principles. These themes hint at a dimension which has thus far not featured prominently in the discussions, the so-called institutional dimension. More will be said about this dimension later. (See §6.3.2.)

#### (b) The NSESD principles

The next set of principles to be reviewed were developed for the Australian Government as part of their *National Strategy for Ecologically Sustainable Development* (Australia, 1992). Hence they are here named the NSESD principles, and they are reproduced in Appendix C8. Given the phrase *ecologically sustainable development* (ESD) one might question in what way it is different from sustainable development *per se*. The NSESD defines ESD as

using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased. (Australia, 1992: 1)

While there might thus be a primary focus on *ecological* sustainability, that is to say living within the limits of nature (the carrying capacity principle), it is also evident that the increase of “total quality of life” is an equally important objective. Hence, with this understanding, and for the purposes of this study, ESD will be taken to be not substantially different from sustainable development as such.

The three-tier structure of the NSESD principles reminds of the hierarchy in the sustainable development framework presented in a previous sub-section (see §5.3.2). The top tier of the NSESD model gives the *goal* of the strategy, and it is then followed by successive tiers representing respectively the *core objectives* and the *guiding principles* of the ESD strategy. To the extent then that the NSESD structure corresponds to the hierarchy of the sustainable development framework proposed in this study, it can be deemed to lend some credence to the said hierarchy.

In reading the preamble to the NSESD principles the holism principle is once again in evidence, even if only by implication through the use of phrases such as:

... consider in an *integrated* [emphasis added] way, the wider economic, social and environmental implications ...

... for Australia, the international community and the biosphere ... [and]

... a long-term rather than a short-term view ... (Australia, 1992: 2).

The first three NSESD principles, or core objectives as they are called in the NSESD document, reaffirm the three-dimensional conceptualisation, the equity considerations, and the future perspective normally associated with sustainable development (holistic thinking again). Principles 4 and 6 also underline the importance of holistic and wide ranging approaches. Principle 5 is more well known as the precautionary principle. The need to include environmental considerations in economic thinking is the theme of Principle 9, and the last principle calls for the involvement of communities in the decisions and actions which affect them.

The principles mentioned thus far appear in some form or another in most other sets of sustainable development principles, but the NSESD Principles 7 and 8 might raise some

concerns. Principle 7 seeks a growing economy, but if the desired growth implies increased material throughput, similar concerns as were raised here above under the OECD principles apply. But, to be fair, this NSESD principle is tempered by the inclusion of environmental protection as a co-requirement. While the international competitiveness called for in Principle 8 might seem somewhat parochial compared to the international co-operation put forward in many other sets of principles (e.g. OECD principles), it is in reality an objective of most countries to be more competitive internationally. And to the extent that this objective could increase the well-being of the local populace of developing countries, one might want to support this principle, but it becomes contentious when developed countries use their economic muscle to gain a competitive advantage against developing economies, some with already dire social and environmental problems. Perhaps, taking into account that these principles were published in 1992, it could be argued, in mitigation, that later Australian regimes might be more progressive in their thinking.

(c) The UK principles

This set of principles, reproduced in Appendix C9, was published by the Departments for Environment, Food and Rural Affairs (Defra) of the UK Government, and they are here designated as the UK principles (Defra, 2005). These principles are noteworthy for the conciseness in which they convey their message; they do so succinctly in only five principles. The layout of these principles places them in a two-tier hierarchy. If one were inclined to apply the terminology of the previous set of principles to this hierarchy, the first two principles, located in the higher tier, could be termed core objectives and the remaining three, located in the lower tier, as guiding principles which, presumably flow from the core objectives. And thus named it is then significant to note that the *living within environmental limits* principle and the *ensuring a strong, healthy and just society* principle are considered as *core* objectives or *foundational* principles. Having in this way addressed the environmental and social dimensions of sustainable development through core principles, what seems to be lacking is an additional principle, on same level, covering the economic dimension. As it is, this lack is addressed by a principle on the next tier, the *achieving a stable economy* principle. If this seemingly lop-sided ranking of principles associated with the three dimensions of sustainable development is not a coincidence or an oversight, it could be argued that it is a deliberate attempt to endorse the interpretation that sees the economic system as a sub-system of the social and

environmental systems. The significance of ranking the dimensions of sustainable development will be more fully discussed in a later chapter.<sup>225</sup>

Another point of interest in the UK principles is that, in addition to the principles already mentioned, which deal respectively with the environmental, social and economic dimensions of sustainable development, there is a fourth principle in the UK suite that is aimed at *promoting good governance*. This hints again, as has been previously observed, at a four-dimensional interpretation of sustainable development. In economic circles this four-part categorisation would be termed *environmental capital*, *human capital*, *economic capital* and *social capital*. In terms more generally associated with sustainable development one might speak of *environmental sustainability*, *social sustainability*, *economic sustainability* and *institutional sustainability*. While further discussion of this four-dimensional model of sustainable development will follow later,<sup>226</sup> it seems that as a number of the sets of sustainable development principles reviewed here lean towards this approach, that there may be good grounds for the proposed sustainable development framework also to be expanded to four dimensions.

It is interesting to note that the last of the UK principles, *using sound science responsibly*, does not appear to enjoy similar prominence in the other sets of principles reviewed, although it does feature as a subsidiary principle. However this first impression of the UK *sound science* principle as being somewhat out of place might be misleading; a deeper reading of it reveals that it, in fact, incorporates the more well-known precautionary principle, which certainly enjoys prominence in many of the other sets of principles.

#### (d) The NEMA principles

The last set of sustainable development principles to be reviewed in this grouping of those with a national orientation, is a suite of principles of South African origin. They are, in fact, the principles contained in Chapter 1 of the National Environmental Management Act<sup>227</sup> (NEMA)

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<sup>225</sup> See §7.1.1 and Figure 7.1.

<sup>226</sup> See §6.3.2.

<sup>227</sup> South Africa, 1998.

under the heading of *National Environmental Management Principles*, and which are here reproduced in Appendix C10. NEMA, in line with environmental law in general, focusses mainly on the *natural* environment. This is evident from the NEMA definition of the term *environment*. It is defined as:

- the surroundings within which humans exist and that are made up of –
- (i) the land, water and atmosphere of the earth;
  - (ii) micro-organisms, plant and animal life;
  - (iii) any part or combination of (i) and (ii) and the interrelationships among and between them; and
  - (iv) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing. (South Africa, 1998: S1)

This narrow focus on the natural environment is countered by a reading of the principles which reveals that many of them (See §2, §3, §6, §7, §9, §11, etc.)<sup>228</sup> reflect a broader social concern.<sup>229</sup> While this broadened thrust of NEMA may be welcomed, the concern may well turn again to an overarching anthropocentric bias, as it emerges in the last line of the above definition. In the principles themselves, NEMA pointedly directs that “environmental management must place people and their needs at the forefront of its concern” ( §2). However if this reservation were to invalidate the NEMA principles, then indeed so would many other set of principles be invalidated. Furthermore the NEMA principles do explicitly pronounce (again in common with many other sets of principles) that “development must be socially, environmentally and economically sustainable” ( §3), thereby endorsing the more holistic approach that is integral to sustainable development.

There may also be concern around the heading applied to the NEMA principles, and the fact that sustainable development itself appears as component of the NEMA principles (see §4). It is felt that to present sustainable development only as a component of environmental management, is to misunderstand its role as an overarching strategy, and as such, the public face of a new paradigm or world-view. Instead, it may be argued, environmental management should rather be a component of sustainable development. The natural and social environments

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<sup>228</sup> To facilitate discussion the NEMA principles will be cited here according to the numbering system as employed in Appendix C10.

<sup>229</sup> Notwithstanding this conclusion, there may still be concern (from a sustainability point of view) around the omission in the NEMA principles of issues such as poverty and general economic matters.

are after all but dimensions of sustainable development.

What may be perceived of as a more specific constraint in the interpretation of the NEMA principles is the directive that these principles apply to “the actions of all *organs of state* [emphasis added] that may significantly affect the environment” (NEMA, §1). As a result one may assume (erroneously it is suggested here) that the actions of individuals and non-governmental institutions are excluded from the ambit of these principles. This, it is claimed here, is an invalid deduction. It goes without saying that all “organs of state”, that is to say government departments and government functionaries, are charged with the broad duty of administering the law of the land. In carrying out this duty they will, as far as NEMA is concerned, apply the NEMA principles wherever they are applicable, and hence these principles will inevitably percolate down to all of South African society. More directly the range of the NEMA principles is enlarged by the sectoral legislation and regulations that are enabled by NEMA. For example, the Environmental Impact Assessment (EIA) Regulations promulgated under NEMA imply that all (listed) activities<sup>230</sup> must also be subject to these principles, and this in turn, means that all companies and organisations involved in development activities, will also have to adhere to these principles. There are no compelling reasons to believe that the NEMA principles are not intended to be broadly applicable to *all* who are and should be involved in sustainable development in this country.

Notwithstanding these or any other reservations around the NEMA principles (or indeed in any other set of sustainable development principles), it is here assumed that the broader trends that will emerge from the many sets of principles included in the review, will override any individual inadequacies.

The principles listed in NEMA are considerably more comprehensive and extensive compared to those emanating from the UK and Australia, which prompts the question of whether the efficacy of a set of sustainable development principles is enhanced or weakened by the length of their presentation. This problem was already discussed under the LWF principles. There it was felt that succinctness was an advantage, but a pragmatic approach would be to judge each

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<sup>230</sup> A listed activity is one that appears on a list (issued under the authority of NEMA) of all the activities that, by law, need to be subjected to an environmental assessment before they are in fact undertaken.

of the principles on its own merits. Certainly some of the NEMA principles are more fundamental than others, and hence a multi-level categorisation of principles in general, ranging from those that are more fundamental to those that are in effect operational guidelines, seems justified as this would reduce, at least the number of basic principles, or make the application of the principles more manageable. This argument endorses again the hierarchical categorisation of principles applied in the sustainable development framework being proposed in this study. The distinction made between foundational principles which are few in number but broad in application, and subsidiary principles which are more in number, more specific in detail, but of more limited application, makes the whole more comprehensible and manageable.

On the other hand, some principles (in long lists) could offer a unique insight that might not otherwise arise (in other shorter lists). For example, the NEMA Principle 13 which deals with a worker's right to refuse to do work harmful to the environment, is quite specific, but it certainly could be advantageous in countries where the unemployment rate is high and workers fear dismissal. Another reason which may be put forward in defence of the list of principles in NEMA, is the point that NEMA is, in fact, law, and hence that it needs to cover all the concerns and problems that the lawgivers foresee, and furthermore that as a legal statement it should be as unambiguous as possible. And so, notwithstanding reservations about long lists of principles, it is felt that the NEMA principles, twenty-one in number, are still at a level where they add to the comprehension of the concept of sustainable development, without succumbing to unnecessary verbosity and repetition.

#### *5.3.3.4 Principles emanating from international conferences*

In this last grouping of sets of principles of sustainable development the principles produced at three United Nations conferences are considered. These conferences were the UN Conference on the Human Environment held in Stockholm in 1972, the UN Conference on the Environment and Development held in Rio de Janeiro in 1992, and the UN World Summit on Sustainable Development held in Johannesburg in 2002. At the conclusion of each of these conferences declarations of principles were produced (UNCHE, 1972; UNCED, 1992; WSSD, 2002), and these are here replicated in Appendices C11, C12 and C13. It needs to be noted forthwith that the so-called Johannesburg Declaration (WSSD, 2002) is a set of statements of explanation or intent rather than principles, and that as such they lack the clarity, pith and

*gravitas* of the other two sets. Most of the Johannesburg statements do however, even if only implicitly, revolve around issues of principle, and they do furthermore also endorse the principles emanating from the previous two conferences.<sup>231</sup> Not only for these reasons, but also for the strong focus in the Johannesburg statements on sustainable development, it is considered appropriate to include them here as a set of sustainable development principles.

Another reason why the principles emanating from these conferences can be accorded high levels of legitimacy is the fact that they were negotiated at forums which were broadly representative, if not of the whole world, then at least of the majority of the world's national states. On the other hand the fact that the conference declarations are obviously the products of negotiation between representatives of constituencies with widely differing perspectives and needs, must have led to some watering down of the principles included in the declarations, in order to accommodate the sensitivities and reservations of particular countries. For example the issue of human overpopulation, while never a popular cause (amongst politicians), only received muted attention in the earlier conferences, and it is not even mentioned in the Johannesburg Declaration. It is also widely acknowledged that the climate agreement reached at Rio was far below expectations due to American resistance. Notwithstanding such misgivings, it is precisely the broad based representation at these conferences which reflects the near universal support not only for the principles appearing in the conference declarations, but also for the concept of sustainable development.

Notwithstanding the above observations that ascribe strength and validity to these conference declarations of principles, one can still identify areas of possible disquiet (for reasons such as have been mentioned). The reducing attention paid to the problem of the burgeoning human population, is a case in point. Another example might be that all the declarations pointedly underwrite human welfare as their primary objective – again a case of anthropocentric bias? It is also noticeable that there is a swing away from an earlier emphasis on environmental issues to a later emphasis on social issues, an overemphasis some might argue. For example, in the Johannesburg Declaration the threats to the sustainable development are listed as the following:

... chronic hunger; malnutrition; foreign occupation; armed conflict; illicit drug

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<sup>231</sup> The fact that at the Rio conference the declaration of the preceding Stockholm conference was also reaffirmed lends a continuity to these three sets of principles, that inevitable must impart more strength and validity to them.

problems; organized crime; corruption; natural disasters; illicit arms trafficking; trafficking in persons; terrorism; intolerance and incitement to racial, ethnic, religious and other hatreds; xenophobia; and endemic, communicable and chronic diseases, in particular HIV/AIDS, malaria and tuberculosis. (WSSD, 2002: §19)

While no one would gainsay the negative impact of these issues on sustainable development, environmentalists would be concerned at the omission of topics such as climate change, consumerism, poaching, etc. from this list. Of course there is mention of environmental issues at other points in the declaration, and while the inclusion of topics such as gender, the youth and indigenous peoples may be said to have given them their rightful place, there can be no denial of the heavy swing towards social issues.

As can be expected from such international conferences many of the principles produced involve issues around international relationships. In this regard the obligations of countries of the North *vis-a-vis* the needs of countries of the South has become a more popular theme. It seems that the voices from the South have progressively become more assertive and demanding, and most might argue that this is simply restoring an imbalance from the past.

It is not considered necessary to give a detailed review of each of these conference-generated sets of principles here. They are repetitive of many of the principles that have already been discussed, and indeed the declarations of the later conferences endorse those of the earlier conferences. This is not to deny their importance, and (as was the case with every set of principles included in the review) their full weight was carried through to the final summary.

## 5.4 CONCLUSION

Having now reviewed thirteen sets of sustainable development principles, it is time to draw some summative conclusions, bearing in mind that the objective has been to identify those principles that should be included in the proposed sustainable development framework of this study. A comparative summary of the reviewed principles, in tabular form, appears in Appendix 14. In the course of the review it emerged that many of the principles seemed to find application, explicitly or by implication, mainly in one or another of a number of possible spheres of activity. These spheres of activity have

previously been referred to as the *dimensions* of sustainable development. This break-down of sustainable development into, usually three, dimensions (these being the environmental, the social and the economic dimensions) is seemingly endorsed by many analysts and organisations. Notwithstanding this general endorsement, it is considered necessary here to subject these three dimensions, and possibly others that could be applied to the concept of sustainable development, to a thorough investigation. The purpose will be to justify the selection those dimensions that are considered, in terms of this study, to be central to sustainable development, and then also to explore the ambit of each dimension. This then will be the theme of the next chapter. And so for the moment a discussion on the summary of principles, as they appear in Appendix 14, will be postponed until more clarity is obtained around the dimensions of sustainable development.

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## CHAPTER 6

### THE DIMENSIONS OF SUSTAINABLE DEVELOPMENT

Operationally speaking, sustainable development is about maximizing economic, social, and environmental benefits subject to a set of constraints ...

- Economic objectives should not be maximized without satisfying environmental and social constraints.
- Environmental benefits should not necessarily be maximized without satisfying economic and social constraints.
- Social benefits should not be maximized without satisfying economic and environmental constraints. (Rogers, *et al.*, 2008: 46)

#### 6.1 INTRODUCTION

The concept of sustainable development would be of little value if it did not lead to concrete actions on ground level. Therefore one of the main challenges facing sustainable development theorists is the need to *operationalise* the concept. Hence, not only do the precepts and principles of sustainable development need to be clarified, but they also have to be unravelled to the extent that they devolve into fairly clear guidelines for practice. It is a fairly common shortcoming of the many definitions of sustainable development that they lack of clarity on the ‘operationalisation’ of the concept. Hence Finn Arler asserts that

Ever since “sustainability” was introduced as the main concept in the modern debate on environmental protection, it has been criticized for its vagueness. It needs to be made more “operational”, the critics argue; otherwise it will end up as yet another fancy catchword with an indeterminate meaning. (2003: 155)

To facilitate the ‘operationalisation’ of sustainable development it might be useful to consider the concept in terms of smaller, subsidiary components. The holistic interpretation of the environment and sustainable development, as discussed in Chapter 1 and the preceding chapter, does not in principle preclude the investigation of smaller components of these concepts, but with a proviso that this must not be done at the expense of the broader view. While many interpretations and definitions of

sustainable development have broken the concept down into *dimensions* (usually three, these being the *social*, the *economic* and the *environmental* dimensions), one must be cognisant of the fact that in such a reductionist approach there is always the danger of losing the broader perspective as reflected in the quotation from Rogers, *et al.* here above. In sustainable development, the principle of holism is considered foundational, and hence the breaking down of the concept into smaller components cannot end there. In the final instance it is the interdependence of and the interaction between the dimensions of sustainable development that is of critical importance. That is why the NEMA definition of sustainable development can expressly demand an “*integration* [emphasis added] of social, economic and environmental factors” (South Africa, 1998: 10).

## 6.2 A THREE-FOLD DIMENSIONALISATION OF SUSTAINABLE DEVELOPMENT

As has been stated, numerous sources in academic as well as popular literature, describe sustainable development as finding expression in practice in three spheres of activity, these being the *environmental*, the *social* and the *economic* spheres or dimensions. Very often these descriptions of sustainable development are further amplified by graphically depicting the dimensions as three overlapping circles. As sustainable development requires the integration of all its dimensions, only activities that are ring-fenced at the *intersection* of the three circles, are said to contribute to sustainability. (See Figure 6.1.) Any activity that is located in only one or two of the dimensions is unsustainable. For example, economic activities that do not take environmental and social constraints into account cannot be sustainable.

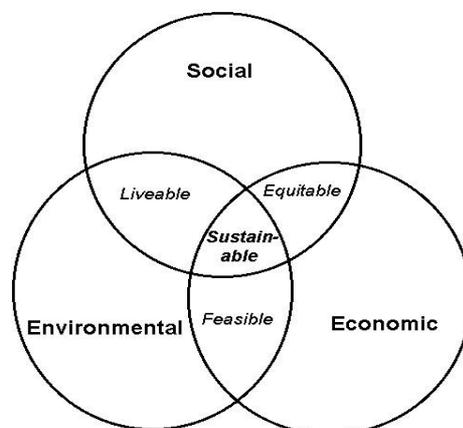


FIGURE 6.1: SUSTAINABLE DEVELOPMENT AND ITS DIMENSIONS  
(After Sogesid, undated: 2)

This threefold dimensionalisation of sustainable development has become so popular that it has been adopted in many company reports as the so-called ‘triple bottom line’ (TBL). The glib adoption of TBL reporting has led some to believe that in many cases only lip service is being paid to the environmental dimension, and maybe to a lesser extent to the social dimension, while the economic dimension remains the overriding concern, and hence of the required integration there is little evidence. A caricature of this approach is presented in Figure 6.2 as the so-called Mickey Mouse model of sustainable development (SANZ, 2009: 8-9).

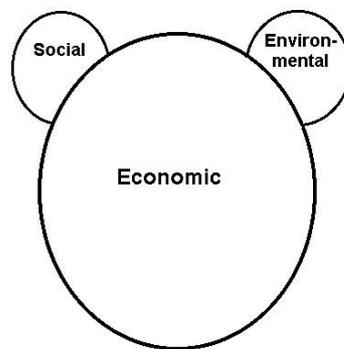


FIGURE 6.2: MICKEY MOUSE VERSION OF THE TRIPLE BOTTOM LINE MODEL  
(After SANZ, 2009: 8)

Returning to Figure 6.1, it could be argued that sustainable development is better represented as a triad of *objectives*, these being the environmental objectives, the social objectives and the economic objectives. With sustainable development itself being at the intersection of all of these objectives, it implies, in theory, a simultaneous achievement of these objectives, or at least that not any of them are negated. This model of sustainable development is depicted in Figure 6.3. There may even be objectives within each of the three two-dimensional intersections shown in Figure 6.3, and if these are added to the objectives that apply to each of the dimensions, the likelihood of achieving all of these objectives simultaneously seems rather remote. This is probably one of the main reasons why it has been so difficult to operationalise the concept of sustainable development. If the objectives are regarded as principles, then one could say that, at a minimum, at least the foundational principles of sustainable development need to be identified and adhered to. The conclusion that development is only sustainable if it is *economically feasible*, *socially acceptable* and *environmentally viable* may help one to understand the concept better, but the practical implementation thereof still remains problematical.

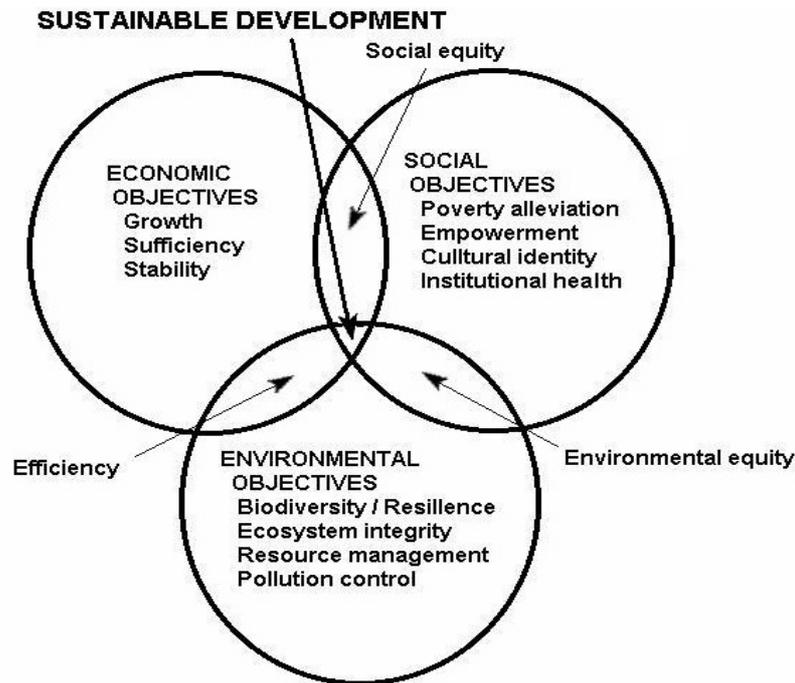


FIGURE 6.3: THE DIMENSIONAL OBJECTIVES OF SUSTAINABLE DEVELOPMENT  
(After FEE2, 2002: 18)

The possibility of differing degrees of economic feasibility, social acceptability or environmental viability, or of having objectives from different dimensions which are in competition with each other, make the ideal of sustainability seem even more remote. Perhaps the most obvious predicament is the lack of a common unit of measure between the dimensions, or in Mawhinney's words, "a common currency" (2002: 18). This makes synchronous assessments of and trade-offs between dimensional objectives intractable, if not impossible. It is thus not unlikely, given the broad ambit of sustainable development and the potential divergence of dimensional objectives, that more detailed expositions and practical applications of sustainable development may reflect a degree of bias towards one or other of the three dimensions, with this bias likely to represent the field of expertise of the theoretician or practitioner involved. While economists may hone in on monetary value as a measure, expressed through such concepts as the Gross Domestic Product (GDP), social scientists would lean towards a measure of human well-being such as expressed in the Human Development Index (HDI). Environmentalists, on the other hand, could emphasise ecological footprints or energy consumption (Mawhinney, 2002: 16-19). Goulet warns against such one-sided approaches by stressing that we need to

articulate a conceptual scheme in which the demands of three distinct ethical values, justice, freedom and respect for nature [read *economic equity, social acceptability* and

*environmental viability*] all become *relativized*. No single one of these values can be taken to have absolute worth; more importantly, each can only be defined and delimited in its proper boundaries with relation to the other two. (1990: 37)

Burger and Mayer's depiction of sustainable development (Figure 6.4) focusses more strongly on the *interrelationships* between the three spheres of activity or dimensions. While this focus may aid by suggesting areas in which sustainable development might be assessed, it still does not solve the problem of the need for a "common currency" to facilitate joint evaluation.

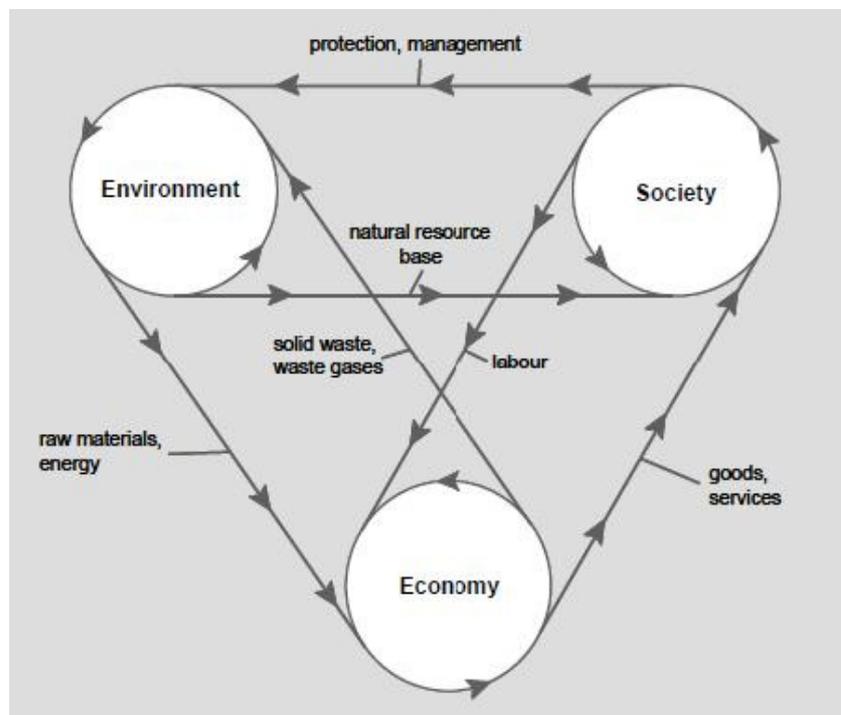


FIGURE 6.4: INTERRELATIONS BETWEEN ECONOMY, ENVIRONMENT AND SOCIETY  
(From Burger & Mayer, 2003: 12)

A later section will be devoted to this difficult problem of assessing sustainable development, but for the moment it is the three-dimensional model of sustainable development that will be subjected to further discussion. Turning firstly to Harrison, we see that one could roughly conflate the three dimensions of sustainable development, economics, society and the environment, with his three "policy narratives", viz., "efficiency, equity and ethics" (2000: 4). Harrison contends further that in the absence of an objective (i.e. scientific) definition of sustainable development "subjective values and beliefs ... [guide] the definition of the problem and the choice of policies" and that as a consequence there "is subjectivity in any policy for sustainable development" (2000: 2, 3). Thus it would be assuming too much to accord absolute status to the three dimensions (or "policy narratives"), but they can be seen

as aids towards interpreting and applying sustainable development. Harrison seems to be reconciled to a somewhat nuanced understanding of sustainable development. He states:

Some recommended sustainable development policies focus on political participation [equity], some on economic efficiency and technology [efficiency], others on how humans think about their place in creation [ethics]. Each ... implies a different meaning for sustainable development: respectively, a more equitable distribution of power, wealth, and knowledge; a technological adaptation to natural goods limits; and an ideational adaptation to natural goods limits. (Harrison, 2000: 3)

Following a socio-historical analysis of the prevalent perspectives in environmental ethics, Merchant (1990), as discussed in Chapter 3, also arrives at a threefold categorisation, which she terms a taxonomy of environmental ethics. Her three categories, “egocentric”, “homocentric” and “ecocentric” ethics, are summarised in Appendix A. Using the three dimensions that have so far been associated with sustainable development as the point of departure, it may be interesting to see how these dimensions, the “ethical values” of Goulet, the “narratives” of Harrison and the “taxonomy” of Merchant could be linked, and then what prime characteristics can be ascribed to each of the dimensions. This linkage and the characteristics are set out in Table 6.1.

TABLE 6.1: A THREE-FOLD CHARACTERISATION OF SUSTAINABLE DEVELOPMENT

<b>Sustainable development dimension:</b>	<b>Economic</b>	<b>Social</b>	<b>Environmental</b>
Goulet’s ethical values:	Justice	Freedom	Respect for nature
Harrison’s narratives:	Efficiency	Equity	Ethics
Merchant’s taxonomy:	Egocentrism	Homocentrism	Ecocentrism
Fundamental good:	Individual good	Social good	Intrinsic value of nature
Overarching principle:	Profit/competition	Utility	Preservation
Dominant socio-political context:	Liberal capitalism	Socialism <sup>232</sup>	Green politics <sup>233</sup>
Environmental implications:	Use of natural resources limited only by the effects on others	Resources used for good of greatest number; centralised management	Sustainability; environmental justice; limits to growth; preservation of ecosystems

<sup>232</sup> Socialism seeks the ‘social good’ through the social ownership of the means of production and central planning, and denies, at least as far as capitalists are concerned, the economic value of competition.

<sup>233</sup> Much of the focus of green politics is on the environmental externalities that both the capitalists and the socialists have little regard for.

While the attempted synchronisation, in Table 6.1, of the three-dimensional approaches of the various theorists might be rough and somewhat artificial, it does lend some validity to the idea of breaking down sustainable development into smaller entities, which need not be hard and fast, or mutually exclusive categories. It also points to the inadequacy of focussing only on one of the dimensions to the neglect of the other two. With this justification and caution, in-depth analyses of the dimensions proposed for sustainable development will be the focus of the following sub-sections. But, to reiterate, while investigating each of the respective dimensions, sight must not be lost of the fact that sustainable development itself requires an integration of the dimensions. And so, while for the moment it might be convenient and instructive to investigate each of the dimensions separately, it is to the theme of their integration that the attention will return in the next chapter.

A last comment on the three-dimensional model of sustainable development, before proceeding to the discussion of each of the dimensions, concerns its apparent weakness in representing another important characteristic of sustainable development, namely that of its future perspective. This could be the conclusion arrived at, given the lack of an explicit expression of this future perspective in the three-dimensional model, particularly when the dimensions are expressed as categories of objectives (see Figure 6.3). Notwithstanding this initial conclusion, it may convincingly be argued that the future perspective can implicitly be read into the dimensional objectives, in particular the environmental (ecological) objectives, where the goal of environmental sustainability could mean little other than that the environment's integrity be maintained into the future, or if we have to be anthropocentric, that nature's goods and services should be available in the long term for the use of future generations. This implicit future perspective might however, in practical situations, not be enough to guarantee it adequate attention. Newton articulates this concern by suggesting that politicians, businessmen and activists whose time horizons may respectively be limited to the next election, the next annual report and the next fundraising deadline, could accordingly dilute their future perspectives. To counter such short term horizons, she proposes, as was mentioned in the previous chapter, a long term horizon stretching seven generations (that is  $\pm 210$  years) into the future (2003:2-3). Also in the previous chapter mention was made of the fact that the assessment of sustainability was a function of the time span of consideration (Bell and Morse, 2008: 14-17). From these observations one may draw two related conclusions; firstly, sustainability is a complex concept the meaning of which is to some extent contextual. Secondly, the explanatory potential of the graphical representations of complex concepts such as sustainable development is inevitably limited, as are the attempts at single sentence or

paragraph-length definitions of sustainable development. This reinforces the conclusion that a hierarchical framework (such as that which is being proposed in this study) is a much better vehicle for conveying the “essence” and ambit of the multi-faceted concept that sustainable development is.

### **6.2.1 The economic dimension**

Much of what is going on in the modern world revolves around the ubiquitous dollar. This is obviously so in the case of Western societies where consumerism has become a way of life. Much of the developing world, on the other hand, aspires to the luxury of Western lifestyles, and they see economic growth as the panacea for most of the social ills that beset the developing countries. This pervasive influence of the economic perspective is further promoted in the modern wave of globalization, particularly too as capital markets have globalized more readily than other aspects of society (Burger, 1997: 9). Even in the recent economic woes that manifested themselves across the world in 2008 and 2009, does one gain a measure of the impact of the economic dimension; an impact which ranges widely across in all nations. In short then, economic issues tend to dominate, and probably control, the agendas of most countries and societies.

With this as a background it is obvious that sustainable development will achieve little if it does not recognise the importance of translating its message into economic terms in order to penetrate and influence the widely prevalent economic thinking. Traditional economics has lacked an environmental perspective, and in more recent times this shortcoming, probably more than any other, has pushed sustainability into modern economic thinking. In Dresner’s words:

The starting point for the concept of sustainable development was the aim to integrate environmental considerations into economic policy. More profoundly, it was conceived as an attempt to bring environmentalist ideas into the central area of policy, which in the modern world is economics. (2007: 63)

Not only does economics play a dominant role in our society, it is also often seen, in environmental eyes, as the scapegoat in many of the problems that beset society, which vary from resource depletion and abject poverty to profligate over-consumption. And if it is economics that often has to carry the blame, then it is businesses, as the drivers of modern Western economies, who must shoulder a large part of that blame. But that is not to say that businesses actively oppose sustainability; their alleged complicity is far more indirect. In fact

in modern times many businesses hold up sustainability as a major goal in their mission statements, and the formation of the *World Business Council for Sustainable Development* (WBCSD) reflects this commitment. The WBCSD champions the strategies of corporate social responsibility (CSR) and *eco-efficiency*. To them CSR is a

commitment of business to contribute to sustainable economic development, working with employees, their families, the local community and society at large to improve their quality of life. (WBCSD, 2002: 6)

And the WBCSD conceives eco-efficiency as

the delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life cycle, to a level at least in line with the Earth's estimated carrying capacity. (WBCSD, 2002:5)

Thus, while maintaining their faith in the free market system, The WBCSD argues that there is a "business case for sustainable development" (WBCSD, 2002). Blackburn also feels that it actually makes good business sense for companies to pursue sustainability policies. He maintains that

ignoring key sustainability trends and issues can impede a company's ability to compete ... [but by] addressing these trends and issues systematically [they] can open new business opportunities and protect the organization from the risk, reputational challenges, and inefficiencies that destroy shareholder value. (Blackburn, 2007: 8)

Yet, in spite the above contentions, it is still argued by many that the practices of businesses in general are not in alignment with their rhetoric on sustainability. In a survey of US businesses it was revealed that less than one-third were increasing their resources towards promoting sustainability and around 14 % were actually reducing their allocations in this regard (Blackburn, 2007: 7).

Business people often see sustainability programs as outside the circle of things essential for success. These programs may be looked upon as the hobby of the chief executive officer (CEO) – something to be tolerated but not taken seriously. They may be considered discretionary measures for image-polishing when times are flush, but something to be quickly jettisoned when financial results slip. Occasionally some enlightened company sets course toward sustainability, but commonly this is understood and pushed by only a few executive champions with the rest of leadership simply riding along ... [For traditional companies] making money is job number one, happy customers and low costs are the keys to this, and these companies see no meaningful way sustainability can help achieve those ends. To them, the idea is, at best, garnish. (Blackburn, 2007: 7-8)

While the lack of congruity between the practices of business and their stated commitments to sustainability may be a matter of serious concern, a more fundamental problem for many are the structural deficiencies which are perceived to be inherent to the neo-classical economic tradition which in general drives Western economies. Economists in this tradition believe that a free market is the most efficient, that is to say socially optimal, way of allocating resources. In the words of Adam Smith, the father of modern economics (as quoted by Cunningham & Saigo):

Every individual endeavours to employ his capital so that its produce may be of the greatest value. He generally neither intends to promote the public interest, nor knows how much he is promoting it. He intends only his own security, only his own gain. And he is in this led by an *invisible hand* to promote an end which was no part of his intention. By pursuing his own interests, he frequently promotes that of society more effectually than when he really intends to. (Cunningham & Saigo, 1999: 160)

While in many cases the efficiency with which the ‘invisible hand’ of the free market operates is demonstrable, most traditional economists would accept that for the market to behave optimally certain assumed pre-conditions have to prevail. These include:

- that all values can be monetised
- that the capacity of the environment to provide natural resources and sinks for waste is unlimited and free
- that well defined property rights apply to all commodities
- that consumers and producers make fully informed, rational decisions.

It stands to reason that in many cases some, if not all, of these assumptions are simply not justified or attainable. Such cases are characterised as examples of so-called market failure which “can lead to overuse of ecosystem services, natural resource depletion, toxification, irreversible species and habitat loss, and unjust distribution of resources” (Herz, *et al.*, 2009: 23). The Stern Review Report on the economics of climate change proclaims, “Climate change is the greatest market failure the world has ever seen.” (2006: viii) Such claims do not sway committed free marketeers from their commitment to the market – they state quite bluntly, for example, that “[i]n the case of climate change the simple, direct and *wrong* solution is to impose *restrictions* [emphases added] on emissions of greenhouse gasses”. Instead they propose economic growth, often heavily sweetened as poverty relief, as the solution (Ågerup, *et al.*, 2004: 16). In addition, they are also quick to highlight weaknesses in the global warming

argument – weaknesses such as the disagreement amongst climatologists on some finer details of this problem, the lack of unequivocal evidence, and the coarseness of climate predictions. And more lately, as the reality of climate change has led to such initiatives such as the Kyoto Protocol, they have claimed that the economic cost of such proposed actions to be vastly in excess of the supposed benefits (Mawhinney, 2002: 33-38; Lomborg, 2001: 318).

Thus while the neo-classic economists, such as Julian Simon and Martin Ågerup, continue to believe that our environmental problems can be solved through the traditional economic approach with its assumption of a perfect market, other, more progressive economists, such as Herman Daly and Dr E. F. Schumacher argue that such a market does not exist. Based on the work of Hawken, *et al.* Mawhinney lists of the following defects of current economic theory and policy:

- a lack of fairness in unregulated markets
- the faulty assumption that rational behaviour underpins the free market
- market failures resulting from subsidies and other efficiencies that are multiplied through the system
- the priorities established within the system such as lowest initial cost being used as the basis for procurement.
- the bias against long-term decision-making which arises from a reliance on discount rate methods. (Mawhinney, 2002: 39-40).

Also aware of the shortcomings of market-based approaches, Dresner paraphrasing Steer, suggests that “economists ... should know their limits”, and that there “are some things you cannot put a money value on ... [things that] stem from deeply held spiritual and cultural roots”, and which need to be ascertained outside of economics through “discussion and the political process” (2007: 80).

Given then such market shortcomings such as those listed above, economists of the ilk of Daly and Schumacher have tried to amend the traditional economic paradigm to compensate for its shortcomings, and in so doing have given birth to new and progressive economic transformations known as resource economics, environmental economics and ecological economics. Essentially the fundamental flaw in the traditional paradigm is the fact that many

environmental resources and services cannot be monetised. So, while traditional economists tend to ignore this flaw by assuming these resources and services to be free, environmentally sensitive economists suggest the use of various techniques such as shadow pricing, hedonic pricing and contingent valuation to develop proxy money values for such resources and services.

The economic dimension of sustainable development is thus characterised by a debate between the traditional economists, and those who, for the moment, may be called the reform minded economists. In the sphere of government the traditionalists highlight the shortcomings of socialist economies. They point to the high levels of environmental degradation that became public after the collapse of the Soviet Union and its satellite states, and argue that in contrast the Western capitalist, free market approach will, on the one hand, protect scarce environmental resources, while on the other, provide sufficient resources to cater for social needs and environmental conservation.<sup>234</sup> The capitalist approach requires minimal government interference, perhaps only on a broad scale in terms of predicting and adjusting to economic cycles, and then also maybe only through taxation to provide services and support systems where the market forces are excessive or weak. Thus traditional economists claim that the market is the most effective instrument available with which to procure sustainable development and they are able to produce a not inconsiderable body of statistical evidence to support their contention. They are able to produce evidence of increases in national levels of population health and reduction in poverty levels as indicators of the broader effectiveness of market based approaches. While they may acknowledge that the market could have, in some instances, failed to produce environmentally acceptable results, they argue that such failures can be avoided by merely making some adaptations to the market, rather than by fundamental systemic changes to the economy (Mawhinney, 2002: 23-29).

As has been pointed out here above it is by no means the case that all economists endorse this benign evaluation of the role of traditional economics. In his well-known book, *Small is Beautiful*, Schumacher has this to say:

[A]bout the *fragmentary* nature of the judgments of economics there can be no

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<sup>234</sup> Free markets also presuppose private property, and hence there is a tendency in free market systems to privatise and commodify environmental goods and services.

doubt ... these judgments are necessarily and *methodically* narrow. For one thing, they give vastly more weight to the short than to the long term ... And then, second, they are based on a definition of cost which excludes all 'free goods', that is to say, the entire God-given environment, except for those parts of it that have been privately appropriated. This means that an activity can be economic although it plays hell with the environment, and that a competing activity, if at some cost it protects and conserves the environment, will be uneconomic. (1993: 29)

It is harsh evaluations such as the above that have prompted a much stronger environmental focus within the broad economic approach, away from the so-called 'traditional' approach, to what has been broadly referred to as the 'reformed' approach. Traditionally the economic dictum has been growth and this implied acceptance of "democratic liberal capitalism ... globalisation ... and evidence-backed decision-making" (Mawhinney, 2002: 32). Not only does this approach, as the traditionalists have argued, create wealth (which contributes to human well-being), but through competitiveness it improves efficiency (which reduces wasteful resource use), and reduces corruption. In short traditional economists believe that economic growth, as measured by an increase in Gross Domestic Product (GDP), can solve the social and environmental ills of the world. Economic growth, they argue, makes everyone more wealthy and provides the financial wherewithal for social services and environmental conservation. However the Achilles' heel of this approach is that *economic growth is not sustainable due to the physical limits of the environmental resources* needed as input. In other words, as no allowance is being made for the depletion of natural stock, there is actually a general depletion in wealth (Mawhinney, 2002: 43-45). According to Daly, what is required is a "change in vision [which] involves replacing the economic norm of quantitative expansion (growth) with that of qualitative improvement (development)" (1996b: 1). And continuing along this line of thinking Daly argues that

GNP<sup>235</sup> accounting does not distinguish growth from development – both lead to an increase in the GNP ... counted as "economic growth." But conflating qualitative improvement and quantitative increase in the same value index leads to much confusion. (1996: 28)

Further shortcomings of this ubiquitous economic indicator, the GDP, include, for example, its inability to account for activities in which no money is exchanged. Activities, such as oil spill clean-ups, it will count as positive, while the effect of oil spills on the environment is actually

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<sup>235</sup> For purposes of the argument here the difference between GDP and GNP (Gross National Product) is not significant.

negative. Another weakness inherent in the GDP measure is that the national accounts of a country do not reflect the trans-boundary environmental impacts of that country's economic activities – “[t]he point is that sustainability is global. There can be no such thing as ‘sustainability in one country’.” (Dresner, 2007: 84)

The above discussion can be summarised in a fundamental criticism that is levelled by environmentalists against (traditional) economists – it is that these economists treat natural capital, i.e. the value that the earth itself has for human beings, as income. Reform minded economists, on the other hand, in acknowledgment of this problem, define, in the context of the economic dimension, sustainability as (at least) *non-declining* total capital (which includes natural and human-made capital). However within this cadre of economists there is also a spectrum of opinions, which in simple terms revolve around the degree to which natural capital can be substituted by human-made capital. In this respect then one could, according to Dresner identify four positions as outlined in the table below:

TABLE 6.2: A COMPARISON OF POSITIONS OF ECONOMIC SUSTAINABILITY  
(Based on Dresner, 2007: 75-77)

Very weak sustainability	Moderately weak sustainability	Moderately strong sustainability	Very strong sustainability
Allows infinite substitutability by technology and abides only by the rule that the total capital, i.e. man-made and natural capital should not decline	Requires the conserving of only critical natural capital, i.e. environmental assets for which there are no substitutes, e.g. the climate regulating function of forests	Allows natural capital to be depleted only when it is compensated for in another way, e.g. using the income from fossil fuel consumption to develop alternative energy technologies	Allows no substitutability – practically an untenable position as it would e.g. not allow the extraction of any fossil fuels

Clearly it is impossible to envisage that the *very strong sustainability* position in Table 6.2 could be anything but a theoretical position. Using fossil fuels as a practical example, can any country, with even a modest economy, function without them? Even the theoretical justification of this position is somewhat shaky – if we are not allowed to use fossil fuels, then who is – a future generation? No, even they cannot, because they, in turn, will have to conserve this non-

renewable resource for a generation to follow after them. What would be the point of preserving fossil fuels forever?

On the other end of the spectrum, there is a position, that of the traditional, rosy-eyed, economist who believes that natural resource use should not be limited at all – they are abundantly available and to not use them would be wasteful. Shortages, if they do occur, will be the incentives for more of such resources to be discovered, or for alternative resources to be developed. Some would argue that this position could not be considered as even weakly sustainable. For them sustainability only begins, albeit in a weak form, when there is recognition of some limitation, and that it requires (in the least) that total capital is to be preserved. This means that while the sum of man-made and natural capital must not decline, natural capital can be run down, provided it is balanced by a corresponding increase in man-made capital. The middle positions in the above table recognise that there are some forms of critical natural capital that can never be replaced by man-made capital, and that there must be a move from non-renewable natural resources to renewables, and that means must be made available to develop the renewable resources.

Being less precise technically, it may be more practical to simply characterise the opposite ends of a sustainability spectrum as those of *weak* and *strong* sustainability. Positions which permit, relatively freely, the substitution of natural capital would fall on the *weak* side of the spectrum, whereas those leaning towards the *strong* side of the spectrum would recognise progressively stronger restrictions in the substitution of natural capital. These restrictions are deemed necessary on the basis of a number of factors. There is, for example, the *complexity* of ecosystem services such as the protection provided by the ozone layer for which there is no man-made alternative. Then there is the *complementarities* that exist between man-made and natural capital such as, for example, between fishing boats and fish stocks. Daly argues:

Weak sustainability would suggest that the lack of fish can be dealt with by building more fishing boats ... Strong sustainability recognizes that more fishing boats are useless if there are too few fish in the ocean ... (2007: 15, 18)

The *multi-functionality* of many natural resources such as forests which provide raw material, maintain biodiversity, regulate water flow and absorb CO<sub>2</sub>, also militates against the substitution of such kinds of natural capital. Furthermore some changes forced onto natural

systems could be irreversible such as the loss of biodiversity, and some could lead to a non-linear reaction from the natural system such as when, beyond a certain threshold, it suffers a sudden and complete collapse. (See Daly, 1996: 76-78).

So while it is possible that many reform minded economists believe in and operate within the paradigm of weak sustainability, there are those, more radical economists, and many other theorists who would argue that weak sustainability itself, is not sustainable. One of these would be Ott (2003: 62-63), who stands for strong sustainability on the basis of:

- the principle of precaution
- inter-generational equity
- the multi-functionality of natural ecosystems
- the complementarity that may exist between natural and man-made capital
- the necessity of conserving critical natural capital.

An argument which is often raised against strong sustainability is its cost, and Bell and Morse use cost as the distinguishing feature between these two types of sustainability. Whereas cost is not an issue in strong sustainability, in the case of weak sustainability the costs

of attainment (financial or otherwise) are important and are typically based on cost-benefit analysis (CBA), which inevitable involves trade-offs between environment and social and economic benefits. (2008: 14)

Thus, while purists may argue for strong sustainability, in practice cost will almost certainly play a role, and hence some degree of weaker sustainability might be considered a more pragmatic option. Either way it is inevitable that substitution will occur – it is its degree of application that is the issue. Daly (1991b: 6-7) addresses this issue through what he calls the “operational principles of sustainable development”. For renewable resources, according to these principles it is required

that harvest rates should equal [i.e. not exceed] regeneration rates ... [and] that waste emission rates should equal [i.e. not exceed] the natural assimilative capacities of the ecosystems into which the wastes are emitted. Regenerative and assimilation capacities must be treated as natural capital, and failure to maintain these capacities must be treated as capital consumption and therefore not sustainable. (1991b: 6)

Logically non-renewable resources cannot be used sustainably, but substitutability does allow some leeway. According to Daly

it is possible to exploit nonrenewables in a quasi-sustainable manner by limiting their rate of depletion to the rate of creation of renewable substitutes. ... [This requires that] any investment in the exploitation of nonrenewable resource must be paired with a compensating investment in a renewable substitute ... The idea is to divide the net receipts from the nonrenewable into an income component that can be consumed currently each year, and a capital component that must be invested in the renewable substitute. The division is made in such a way that the renewable will be yielding, by the end of the life of the nonrenewable, an annual sustainable yield equal to the income component of the nonrenewable receipts. (1991b: 6)

From the above discussions it would obviously be misleading to suggest that all reform-minded economists subscribe to a unitary position, unless it is expressed in very general terms such as a position which simply underwrites “the need for more vigilance, [the] setting [of] clear goals which incorporate social and environmental concerns, [and the] identifying [of] dysfunctions in the market ... [which] require removal or improvement” (Mawhinney, 2002: 42). At the risk of over-simplification it may be taken that reform-minded economists can be categorised as leaning either towards weak or strong sustainability.

It is also clear that there has been a progression in economic thinking over time that parallels the societal increase in environmental awareness. This progression has seen an increase in environmental emphasis from the traditional economic paradigm with its perception of free environmental goods, to *environmental economics* with its focus on the cost of environmental resources, through to *ecological economics* where the issue of ecological limits is prime. And from this latter perspective, and also echoing some of the points that have been made in the preceding discussion, the following economic guidelines for sustainable development may be formulated, and considered as principles for inclusion, in the yet to be finalised sustainable development framework:

- critical ecosystems that provide essential life support must be maintained (that means *inter alia* that renewable resource use must be below the ecosphere’s regenerative capacity),
- waste can only be generated at rates below the ecosphere’s assimilative capacity,
- eliminate virgin material requirements by using materials that have been recycled and are recyclable, and
- non-renewable resources may only be consumed at a rate below that at which they can be replaced by renewable substitutes (Herz, *et al.*, 2009: 34).

## 6.2.2 The social dimension

Even if, in the final analysis, the social dimension appears more diffuse than the more structured constitution of the economic and environmental dimensions, there is no doubt that for many it is the prime focus of sustainable development. Human well-being is not infrequently mentioned as an explicit principle or objective of sustainable development. For example the principles of the Lutheran World Federation (LWF, 2000), the principles of the National Environmental Management Act (South Africa, 1998), and the Rio Declaration on Environment and Development (UNCED, 1992) respectively include the following:

The well-being of human persons is the priority concern of sustainable development: Sustainable development is human-centred. It is concerned with the lives and well-being of people in their communities, rather than with narrow economic indicators averaged out over localities, nations or regions. It is concerned with the well-being of the whole person, physical, spiritual and psychological and with the realization of the potential of each individual, in the context of his or her community. (Appendix C3, §3)

Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably. (Appendix C10, §2)

Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature. (Appendix C12, §1)

And so while the economic dimension might enjoy a *de facto* dominance and the environmental dimension an emotional attraction, it is the social dimension which enjoys ideological supremacy.

But having said that, it must again be obvious that there can be no absolute separation between the dimensions. Social concerns are, for example, often strongly linked to economic considerations and environmental restraints. But even in these multi-dimensional approaches some perspective bias may be in evidence. For example, in socio-economic considerations, approaches from an economic perspective may focus more on economic efficiency, whereas approaches from the social perspective might lean more towards issues of social equity and poverty relief. These different focusses might at times be somewhat contradictory. In fact one of the main criticisms levelled against the economic approach would be the argument that its

objective of an efficient distribution of resources, is not necessarily, and maybe seldom is socially equitable. Thus even wealthy countries, with strong free market economies, have not been able to eradicate poverty. In a similar fashion a narrow focus on environmental protection (an objective of the environmental dimension) may also be criticised, by those with a stronger social bias, for placing environmental integrity above social equity and poverty relief. Even Arne Naess, strong environmentalist that he might be, acknowledges that environmental approaches (see § 6.2.3) cannot ignore social issues, for as he says, "... ecology has a social justice side" (1992: 95). In fact, as has been argued earlier, the concept of sustainable development only really gained its modern day popularity and near universal acceptance, once its social dimension had been unambiguously articulated.<sup>236</sup>

According to Rodgers, *et al.* the "*key factors* [emphasis added] governing sustainable development are poverty, population, pollution, participation, policy and market failures ... [these being] the major pillars on which sustainable development rests" (2008: 47). Social issues are clearly very prominent in this statement, and significantly the problem of poverty is the first mentioned. Rodgers, *et al.* state, quite categorically: "Poverty is the most significant socioeconomic dimension of sustainable development." (2008: 219) While economists may claim that an overall reduction in poverty has occurred over time, evidence has been produced to show that the disparity between the rich and the poor is actually increasing, and that the absolute number of poor remains depressingly large.

- 2.8 billion people worldwide still live in absolute poverty on the purchasing power equivalent of two US dollars or less;
- The last three decades have seen a five fold increase in the difference in per capita income between industrialized and developing countries from less than US\$5000 to more than US\$25000. Around the world, those twenty percent of the population with the lowest incomes have seen their share of total income fall from 2,4% (1960) to 1,4% (1993), while the share enjoyed by the twenty percent with the highest incomes has risen from 70% to 85%. (Leisinger, 2004: 8-9)

Globalisation which ensures that no country is an island anymore, is claimed to exacerbate the issues around equity. It abets the flow of capital and expertise from poor to rich nations.

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<sup>236</sup> Notwithstanding the strong social focus of so many sources, it must be reiterated that sustainable development itself is still about the *integration* of social, and economic and environmental issues.

Agricultural subsidies in rich nations are destroying the competitiveness of the farmers from poor nations. Given the realisation that environmental concerns are relegated to secondary status in societies where large scale economic deprivation prevails, even the environmentally-minded have joined in calls for greater equity between the “haves” and the “have nots”. Proposals to address this problem range from demands for the implementation of more efficient policies to more radical societal reforms. Despite counter arguments from free marketeers the liberal capitalist system is seen by many as being instrumental in marginalizing the poor. On the other hand the image of socialism has been sullied in the face of the social deprivations (and poor environmental record) that became evident after the collapse of the former communist countries of Eastern Europe. Even those communist regimes that still exist today do not have much to boast about in respect of their record of advancing social well-being or human rights. But against this, some argue that communism has always perverted true socialist ideals. And so, in line with some of the schools of thought in environmental ethics, as outlined in Chapter 3, socially oriented approaches such as social ecology, ecofeminism, or ‘return to nature’ programmes, continue to be put forward. The greater emphasis on environmental justice and the preservation of social capital inherent in these approaches would, it is claimed, not only address social concerns in general, but also counter structural poverty (Mawhinney, 2002: 72-78).

Having highlighted the significance of poverty, its alleviation becomes a crucial function of sustainable development, but in that there is a danger that poverty relief might simply be seen as an economic issue. This may be related back to confusion about what is meant by development. Dresner asks, “Is it about human development by improving education and health, or about material consumption through economic growth?” (2007: 68) The economic growth paradigm requires countries to industrialise (i.e. grow their GDP), the assumption being that the increased wealth so generated would trickle down to the poor. However the failure of development policies based on this point of departure, as evident in the statistics quoted in the previous paragraph, has led to a move away from the simplistic economic understanding of development, to a broader understanding which places the emphasis on *human* development. Development, in this broader conceptualisation, is not only about people’s level of income, but also about promoting “people’s capabilities to lead the lives they value ... capabilities such as health, knowledge, self-respect and the ability to participate in society” (Dresner, 2007: 70).

To this end new measures of development, which attempt to measure this broadening in focus, have been put forward. For example the United Nations Development Programme (UNDP) has produced a Human Development Index (HDI) which also includes in its measures such aspects as life expectancy and literacy statistics. Herman Daly proposed the Index of Sustainable Economic Welfare (ISEW) which includes “adjustments for depletion of natural capital, the costs of pollution and social issues like increasing *unemployment* and *inequality*” (Dresner, 2007: 101; [emphases added]). In support of this broader conceptualisation of development, one might refer back to studies which indicate that human happiness can only be weakly linked, if at all, to material wealth. Certainly most people would like their basic material needs met, but after that it is more large wealth differentials rather than low absolute levels of wealth that make people unhappy. It is also the older, more singular understanding of development, which links it to economic growth, that prompts some environmentalists’ preference for the term ‘sustainability’ rather than ‘sustainable development’ (Dresner, 2007: 68-71, 73-74).

It is unavoidable in a discussion on the social dimension of sustainable development not to get involved in the topic of human rights. Indeed, not many protagonists of sustainable development would be able to defend their vision of the concept if it did not include a broad recognition of human rights. But there is another aspect to this recognition as well. In terms of the dimensions of sustainable development it needs to be noted that the social dimension is different from the other dimensions in one important respect. The social dimension obviously encompasses human beings, and as such, unlike the other dimensions, it not only incorporates the conceivers of the whole idea of sustainable development, but also the only beings who are capable of implementing it. Thus as much as a discourse on the social dimension of sustainable development involves a consideration of the human *rights* associated with sustainable development, it should also involve a discussion of the *duties* imposed on humans with respect to their role as the implementation agents of sustainable development. These are not only the duties directly related to the promotion of sustainable development, but also those pertaining to any human activity that could have a positive or negative bearing on sustainability. It is in this context that Caldwell lists a number of areas in which human behaviours reflect a failure to recognise the sustainability duties applicable in those areas, and which, as a consequence, become obstacles to the operationalisation of sustainable development. These are:

- excessive growth of human populations;
- disinclination to foresee or forebear;

- short-term assessment of opportunity;
- failure to respect natural systems;
- over-reliance on technological ingenuity. (Caldwell, 2001: 1752)

With some notable exceptions (e.g. Julian Simon who believed that larger populations provided a greater human resource base) most theorists recognise the problem of an exponentially growing human population.<sup>237</sup> However population control is an emotion laden concept, and few politicians are prepared to nail their colours to that mast. Not so Caldwell, who as an academic probably was less susceptible to political pressures, and hence could, referring to humans, assert that

in many countries the numbers, the age distribution, and speed of population increase constitute major obstacles to the achievement of rational development goals and sustainability. If the behavior of other species has analogical relevance, population growth exceeding sustainability will be followed by a population crash. If humanity imposes no limits nature will.<sup>238</sup> (2001: 1753)

To foresee and forbear (the lack which constitutes Caldwell's second obstacle) means to understand, as best one can, the implications of our present actions on future generations, and with such insights to pursue restraint and frugality. According to Caldwell, "Albert Schweitzer is reported to have said that mankind, having lost the ability to foresee or forbear, would end by destroying the Earth." (2001: 1753) Lack of insight into the future is abetted by the human inclination to think short-term (Caldwell's third obstacle), that is within one generation. Failure to respect natural systems (Caldwell's fourth obstacle) combined with unwarranted technological optimism<sup>239</sup> (Caldwell's fifth obstacle) inclines human beings to work against rather than with nature; nature needs to be *conquered*. Yet Caldwell refers to a conference where it was reported on fifty case studies of international development projects which failed due to non-recognition of prevailing environmental conditions and instead favoured political payoffs and short term thinking (2001: 1754).

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<sup>237</sup> The report *People and the Planet* deals quite extensively with the problem of population growth (Royal Society, 2012: 15-45). Swilling and Annecke stress the impact of urbanisation on population numbers (2012: 40-41).

<sup>238</sup> In this vein one might consider, as an example, the relationship between the HIV/Aids scourge and population size. If such viruses develop opportunistically, the probability of the outbreak of such diseases must be bigger in large populations. Furthermore, if a smaller population implies less poverty and lack of education, then the incidence of the disease in such smaller populations should also be reduced.

<sup>239</sup> While Caldwell warns against techno-optimism, there can be no doubt that technology plays an immense role in modern society; so much so that a case can be made for introducing technology as a fourth dimension of sustainable development. This idea will be pursued further later in this chapter.

It will also be argued later in this study that the granting of human rights is closely associated with the duties to protect and uphold these rights. The conclusion here is that a conceptualisation of sustainable development without any reference to the corresponding duties or responsibilities that it implies, will be incomplete.

But to return to the social dimension itself; it may now be concluded that a policy or strategy that does not address at least the following issues will not be able to pass muster as a sustainable development policy or strategy:

- population dynamics
- poverty
- equity
- human rights such as the rights to health, education, security, etc.
- human responsibilities.

### **6.2.3 The environmental dimension**

Mawhinney characterises the environmental approach to sustainable development as being a counter to that of the socio-economic approach (2002: 49-70). Here the economic mantra of growth is, at the very least, questioned, but more seriously, viewed as the main contributor to the environmental malaise of the world. If the World Bank can be seen as a main proponent of the economic approach, then the World Wildlife Fund (WWF) can be seen as a main player in the environmental approach. In *Caring for the Earth*, the WWF, and other similarly minded organisations, promote an environmental approach to sustainable development which, while admitting to the goal of “improving the quality of life”, clearly places this within the restriction of remaining “within the carrying capacity of supporting ecosystems”, and furthermore insists that, while “[e]conomic growth is an important component of development, ... it cannot be a goal in itself, nor can it go on indefinitely” (IUCN, *et al.*, 1991: 9-10).

The environmental approach thus focusses on preserving the natural environment and in the context of sustainable development the following rules come into play (Burger, 1997: 10-11):

- the regeneration rule which requires that the rate of extraction of natural resources

- should not exceed their rate of regeneration,<sup>240</sup> and
- the substitution rule which allows the use of non-renewable resources commensurate with the development of substitutes.

In the above one can recognise the ‘operational principles’ of Daly (1991b: 6-7) that were referred to in §6.2.1 under the economic dimension. This correspondence suggests that what happens in the environmental dimension, depends to a large extent on what is happening in the other dimensions. In the context of sustainable development and put in very simple terms: environmental impacts are the result of socio-economic activities. Very few will argue that the main objective of the environmental dimension is to preserve environmental integrity. However the point here is that the degree to which this objective is realised, depends largely on what happens in the social and economic dimensions. To use a simplistic example: in order to preserve a unique woodland requires ecological knowledge, but even if the ecological knowledge is available, the woodland will not be preserved unless the political will (social motivation) and the finances (economic motivation) are there to do so. This argument underlines, on the one hand, that the dimensions of sustainable development, as has been said, are by no means mutually exclusive, water-tight compartments, and on the other hand, that a discussion of the environmental dimension (beyond ecological technicalities) involves to a large extent, the social and the economic determinants of environmental conditions. Thus the discussion will now proceed on this basis.

While many progressive economists would accept the need for environmental conservation and protection, some would still insist that economic growth is the most effective route towards this goal. Unfortunately the available data, and the way in which it is applied, does not necessarily lead to clear cut conclusions. As much as economists may quote economic evidence supporting the success of growth based initiatives, environmentalists will produce scientifically based evidence showing that matters are deteriorating. And while, on the one hand, economically based evidence may only indirectly relate to environmental conditions, predictions of environmental collapse based on scientific environmental modelling have, on the other hand been conspicuously inaccurate, environmental systems being as complex and difficult to model

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<sup>240</sup> This rule also requires that when nature is also used as a waste sink, and this can only be done at a rate that does not exceed nature’s waste assimilation capacity.

as they are. Inevitably thus some subjective political bias could and does colour the environmental interpretations from either of the socio-economic or environmental approaches, and that in itself could reduce the potential for a consensus (Mawhinney, 2002: 62-63).<sup>241</sup>

The Green (or environmental) argument against the use of economic growth as a measure of human and environmental welfare is based firstly on the contention that some economic activities are in fact incompatible with human and environmental welfare, and secondly on the faulty notion that economic growth can be sustained indefinitely. And it is precisely for these reasons that alternatives to the economic growth measure, the GDP, such as the HDI and ISEW have been proposed (see §6.2.1). Reform minded economists defending economic growth suggest that it is growth based on the consumption of materials and energy that needs to be challenged, and that we should move to growth in the value of goods and services in the economy. Be that as it may, economic growth is undeniably a main plank of capitalism, and in Western societies this has resulted in an unprecedented wave of consumerism. And if inveterate consumerism is the problem it is hard see how it can be radically reduced, especially in democratic societies. One may, together with David Pearce (as quoted by Dresner, 2007: 101), be “totally at a loss to know who the people out there are who’ll vote against economic growth”. People want material goods, television sets, motor cars and increased pay packets. And so, from a Green perspective, it is the consumerist basis of the capitalist system itself which is seen to be the crucial flaw, on the one hand because of its high material throughput, and on the other hand because of its entrenched position.

Because of these inherent weaknesses in the capitalistic model many environmentalists have preferred a socialistic approach. In theory the central control of the latter approach could ensure more sound environmental practice compared to what the case would be under the *laissez-faire* conditions of the former. But it has already been mentioned that the collapse of the Eastern European communist regimes in the nineties revealed the results of such poor environmental practices in these countries that socialism lost much of its lustre. A recently more favoured Green approach is that of workers’ cooperatives, a kind of market socialism, where the low level of initiative evident in the central planning of state socialism is replaced by a level of

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<sup>241</sup> As an example of the lack of consensus consider the much publicised debate and wager between the economist, Julian Simon and the ecologist, Paul Ehrlich (Cunningham & Saigo, 1999: 167).

competitiveness between cooperatives, but where worker exploitation by capitalist bosses is also avoided as the workers are the cooperative owners. A problem that remains, even with this type of system, is that an environmental ethic is no more apparent in it than in a central planning model, and the exploitation of the environment is still possible and even likely. Competing cooperatives would have no clear systemic incentives to address broader environmental problems, and therefore the need for some degree of central regulation would still remain (Dresner, 2007: 101-107).

Notwithstanding these other politico-economic systems, it is probably still the capitalistic approach that prevails most widely, and many of its adherents still regard this model as the best for achieving social and environmental goals. In this vein Huntley, Siegfried and Sunter championed a socio-economic “high road” for South Africa. It is only in their “high road” scenario, based on a free-enterprise economy with limited government intervention, that they see the potential “to meet the most critical goal of all from an environmental point of view: a slowed rate of population growth”. And they concluded furthermore that only this system could provide “a robust economy and a politically stable community [needed to] ... provide the means and the commitment required for the wise use of natural resources” (1989: 80, 84 & 113). Today, more than twenty years later, one can see that the South African system has, despite having met many of the “high road” requirements, not yet fully delivered on the predicted results. Certainly the population problem seems very low on the political agenda, but, on the other hand, the environmental policy framework in SA is quite extensive. However, problems of capacity abound, and these seemingly allow fresh environmental problems to emerge, as is most recently evidenced by the soaring poaching of rhino.

The human impact upon the environment stems, as has been mentioned, not only from the vast human numbers, but also from the intensity of natural resource use. This twofold human impact on the environment has become a source of contention between the developed countries of the North, with their high per capita resource use, and the developing countries of the South, with their high population growth rates. The problem of large families, as encountered in the South, is complicated by issues of poverty, ignorance and culture. While the immoderate levels of consumption of the North appear blatantly unfair, a simplistic call for a reduction of this excessive consumption will not automatically, as Pearce points out, mean that more is available

for the South. If a country in the South is a provider for Northern consumption, it may in fact experience reversed fortunes if consumption levels in the North are reduced (Pearce as quoted by Dresner, 2007: 89). Daly modifies Pearce's view by maintaining that while it is

... Northern growth [which] makes things worse by preempting the remaining resources and ecological space needed to support economic growth in the South up to a sufficient level ... [and consequently] also increases global income inequality and world political tensions ... [it is] continued *development* in the North [that is needed] but not *growth*. [This means] replacing the economic norm of quantitative expansion (growth) with that of qualitative improvement (development). (1996: 8, 1)

So it is the reduction of 'ecological space' caused by excessive consumption by countries of the North that is problematic, as it impacts on the availability of 'ecological space' for countries of the South. Consumption here refers not only to material throughput, but also to waste production. The example of global warming has already been mentioned. Countries of the North, through, *inter alia*, their profligate use of fossil fuels, contribute to global warming proportionately far more than do countries of the South. Yet the negative consequences of global warming are shared by all, and furthermore it is argued, countries of the South are, because endemic poverty and lack of technical resources, far less able to counter the effects of global warming, and hence suffer relatively even more (Dresner, 2007: 88-90). Thus sustainable development will require different approaches from different countries. In this vein, Naess, while arguing for both groups of countries to adopt more sustainable approaches recognised that "[s]ustainable development today means development along the lines of each culture, not development along a common, centralized line" (1992: 95). But even the "development along the lines of each culture" is problematic, for is it not the Western culture of consumerism that stands accused? The conflation of sustainable development with economic growth cannot be correct for countries of the North. Development for countries of the North (not economic growth) could mean, for example, that technology is applied towards achieving greater levels of efficiency, thereby considerably reducing resource consumption. Thus, many environmentalists

no longer see the problem in terms of a need to end global economic growth almost immediately and reduce the environmental impact of Western lifestyles through a programme of Gandhian voluntary simplicity. [Instead they emphasise the] potential [of] an efficiency revolution [to] reduce the degree of social and cultural revolution that is regarded as necessary. (Dresner, 2007: 91)

Greater efficiency can also be achieved by identifying the “enormous number of hidden subsidies, information deficits and perverse incentives” that cause market failures, and which in themselves “prevent the implementation of energy and materials efficiency” (Dresner, 2007: 91).

Having discussed a range of socio-economic positions, their influence on the environment, and having acknowledged the hegemony and the inadequacy of Western capitalism, it may be appropriate to turn once again to the more philosophical orientations that were discussed in the chapter on environmental ethics. These are perspectives that range from anthropocentric environmentalism to non-anthropocentric ecocentrism. While these perspectives might agree that continual economic growth is unsustainable and that this conclusion will, in time, be confirmed as physical resource stocks become depleted and waste assimilation limits are reached, their proposed solutions to the dilemma of economic growth could differ markedly. The anthropocentrists would generally still favour the current economic systems, but with moderate adaptations. Furthermore science based technological approaches would for them still be the way to go in addressing environmental problems. Ecocentrists, on the other hand, would favour radical political changes and material redistribution, and also would be very sceptical of big business and technology in being able to address environmental problems (Mawhinney, 2002: 65-69). Engel goes so far as to suggest that

the entire model of modern industrial development is seriously awry. Not only the economic values of competition and consumption but the expectation of unlimited material growth; not only the prevalence of technology but the view of the world as a machine; not only the hierarchies of power, wealth, status, or sex but the idea of hierarchy itself; not only the dichotomy of resource conservation versus ecocentrism, conservation versus development, humanity versus nature, theory versus practice, intrinsic versus extrinsic values but the need to think in dichotomies at all. In other words, the basic world view or image of social and cosmic reality in terms of which scientific, moral, political, and most other questions have been asked and answered since the beginning of the modern industrial era is being questioned. (1995: 9)

The end result is once again that no clear final picture emerges. While it is evident that there is a range of socio-economic approaches towards the environment, and also a spectrum of different theoretical perspectives on the environment, no one combination of these seems to stand out as the highway to sustainability. Instead it seems that there might be many byways to sustainability, and one would imagine dead-ends as well. Once again one is compelled to

acknowledge the need to adopt a pluralistic pragmatic approach in sustainable development. The relative positions of these approaches and perspectives can be illustrated on a socio-economic/environment frame of reference, as was done by Hopwood, *et al.* Their depiction is reproduced in Figure 6.5.

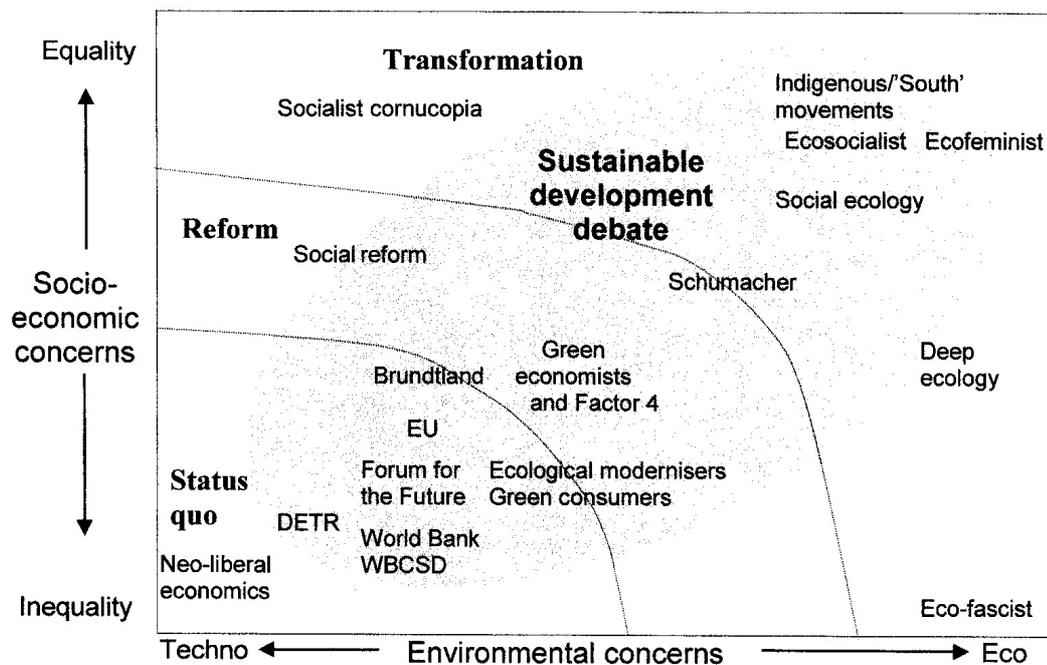


FIGURE 6.5: MAPPING SUSTAINABLE DEVELOPMENT VIEWS  
(Mawhinney, 2002: 64)

The above depiction of the many views of sustainable development underlines the lack of clarity around the concept, a characteristic which, as has been pointed out, could be a factor of strength, as judged by the depicted wide array of adherents it attracts, or it could be, as a result of contestation between the different groupings of adherents, a factor of weakness, which could constrain sound practical applications. The above depiction subsumed the three dimensional model of sustainable development (two dimensions on the vertical axis and the third on the horizontal axis), and if, as will be done in the next sub-section, yet another dimension is introduced, one may despairingly anticipate an even further obfuscation of the concept. However, the common saying that one cannot see the wood for the trees, may be applicable here. It is felt that after completion of this exploration into the concept of sustainable development, it will be possible to elaborate the sustainable development framework being proposed in this study to such an extent, that justifiable guidelines for sustainability practice could readily be derived from it.

This sub-section on the environmental dimension of sustainable development is concluded by reiterating the prime position of this dimension in the broader understanding of sustainable development. Indeed one could argue that if, in the long run, the *environmental* objectives of sustainable development are not met, it will in any case not be possible to meet the objectives of the other dimensions. James Lovelock expresses this sentiment as follows:

I see the Earth's declining health as our most important concern, our very lives depending upon a healthy Earth. Our concern for it must come *first* [emphasis added], because the welfare of the burgeoning masses of humanity demands a healthy planet. (Lovelock as quoted by Zipplies, 2009: 18)

While a fundamental environmentalist might object to the anthropocentric bias in Lovelock's instrumental view of nature, the practical outcome, irrespective of its motivation, is a deep concern for maintaining the ecological processes of nature. Lovelock's feelings are echoed by Daly (see also §6.2.1), who goes so far as to define sustainable development in terms of this single dimension:

Sustainable development ... is development without growth – that is without throughput growth beyond the regeneration and absorption capacities of the environment. (1996: 13)

This positioning of the environmental dimension as key to sustainable development is vital to a fuller understanding of the concept.<sup>242</sup>

### 6.3 CAN SUSTAINABLE DEVELOPMENT HAVE OTHER DIMENSIONS?

The discussion thus far suggests that the “essence” of sustainable development may be captured within the triune grouping of social, economic and environmental objectives, where each of these groups of objectives represent a dimension of sustainable development, as depicted in Figure 6.3. However there are theorists who have proposed four or more dimensions for sustainable development. The approach followed in this study is that the number of dimensions is not fundamental – it has in any case repeatedly been stated that the dimensions themselves are not mutually exclusive categories. The dimensional categories, be they three, four or more, are simply put forward to facilitate a better

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<sup>242</sup> This argument foreshadows the nested interpretation of the dimensions of sustainable development, the discussion of which will occur later in §7.1.1.

understanding of the concept of sustainable development. In this spirit some four-dimensional breakdowns of sustainable development will be discussed here below.

### 6.3.1 Technological dimension

Given the engineering leaning of this study, it may be useful to briefly highlight yet another focus within sustainable development, one that might be extrapolated to a so-called technological dimension. One could argue that the justification for positing technology as a fourth dimension can be found in the Ehrlich-Holdren equation,  $I = P \times A \times T$  (See §1.2.3),<sup>243</sup> where loosely, I can be said to represent the environmental dimension, P and A the socio-economic dimensions, and T then the technology dimension.

As bias can develop in each of the other dimensions of sustainable development, so too it is possible for a technocentric bias to develop as a result of an over emphasis in the technological dimension. Technocentrists are unduly optimistic about the ability of technology to address environmental concerns, and they will defend this optimism by pointing to the past record – a record which shows that many historical improvements in the quality of human life can be ascribed to technological innovation.<sup>244</sup> On the other hand it is also easy to identify many environmental problems that can be laid at the door of technology.<sup>245</sup> Notwithstanding the positive or negative views expressed about technology, it should be obvious that in itself technology is neutral, and that such problems as there may be laid at its door, arise from the abuse or inappropriate use of technology.

It also needs to be acknowledged that modern society is inextricably locked into the application of technology, and that while minimalist, back-to-nature approaches may have romantic appeal, there is no prospect whatsoever that society in general will turn its back on technology. Thus, the only sustainability option realistically available in the arena of technology, is to apply the

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<sup>243</sup> This equation is also otherwise known as the IPAT identity – see also §7.1.2 for a further discussion on it.

<sup>244</sup> Consider, for example the improvements to the quality of human lives brought about by the technological advances in water supply and sanitation.

<sup>245</sup> For example, the technology of the internal combustion engine has no doubt contributed significantly to the problem of global warming.

technology appropriately. Harking back to the distinction that Daly draws between development and growth, where the former can be said to refer to greater efficiency in resource use, and the latter to increased material throughput,<sup>246</sup> it follows that the employment of more sophisticated technology should at least be aimed at greater resource productivity and smaller environmental footprints. It has, for example, been claimed that efficiency increases of the order of four to ten-fold are possible. These claims are made against a background of highly inefficient resource use at present – for instance wastage levels of over 90 % in material and energy use have been reported in the American economy. It is also feasible to consider increasing the design input into developments. Design costs generally only make out a small proportion of the life cycle costs of developments, and thus by allowing more design effort the life cycle environmental performance of such developments could be increased significantly at a relatively low increase in total cost. Nevertheless, on the negative side, it also needs to be noted that the practice of technology in Western democracies seems to be tied inseparably to the prevailing free-market economic model. It is thus hard to imagine that modern day technologists “would ... [want to] query the assumption that growth is good” (Mawhinney, 2002: 78-82).

If then, for the moment, technology is admitted as a fourth dimension of sustainable development, it will include at least the objective of technical feasibility,<sup>247</sup> which is what engineers have traditionally seen as their task. But then, as stated previously, the sustainability of a development has to be assessed through the degree to which the objectives of each of the dimensions (including that of technical feasibility) can simultaneously be optimised. Building on Figure 6.3, this four-dimensional model of sustainable development has been depicted as four intersecting circles, with sustainable development itself being represented by the area which is common to all four circles (see Figure 6.6). This expanded model of sustainable development should resonate with engineers and technologists as, in the added dimension, they will find scope for expressing their particular brand of expertise. Here, by reason of their exacting training, they will feel confident, and thus willing to interact, on equal footing, with experts from the other dimensions. Further value that may be derived from this depiction of sustainable development, lies in the degree to which it can convince engineers of the

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<sup>246</sup> See §6.2.1 and §6.2.3.

<sup>247</sup> Other objectives in this dimension might include greater resource productivity and design input, as has been mentioned, and also recyclability and appropriateness.

importance of the other dimensions of sustainable development, and consequently also of the need for them to allow environmental and social issues, in particular, to influence and amend their designs.

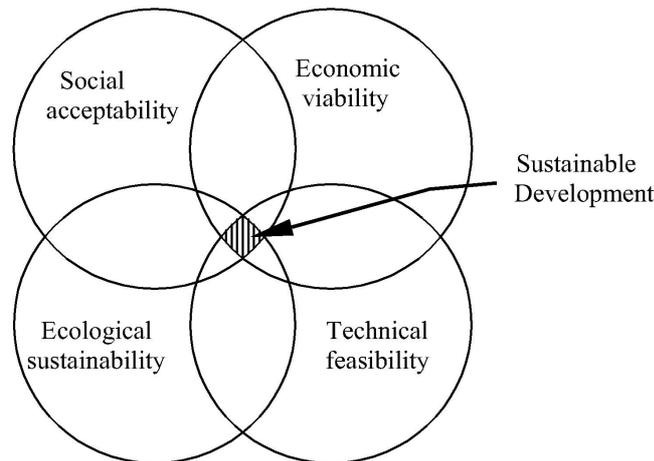


FIGURE 6.6: FOUR DIMENSIONS OF SUSTAINABLE DEVELOPMENT  
(Long, 2001: 6)

It must be said that the three-dimensional model of sustainable development does not necessarily imply that technological issues are ignored; they are in fact subsumed under the broader range represented by the socio-economic dimensions. Wherever natural resources are used or waste is generated, technology is at play. Technology, whether through its own dimension or through the socio-economic dimensions, contributes to the position at which various practices can be found on the strong/weak sustainability spectrum. Given the close identification, referred to previously, between technology and the dominant Western free-market paradigm, it is probably correct to say that most of the modern day technology practice fits, at best, into the weak sustainability category. Given this strong free-market/technology link one would not expect that the radical paradigm shift, as presupposed by strong sustainability, to emerge spontaneously from within the engineering profession as a whole.<sup>248</sup> This is not to gainsay that many individual engineers pursue sustainability to limits far beyond that considered to be only weakly sustainable. However it is the profession as whole which, if the Western economic paradigm is perceived to be the problem, cannot avoid the associated taint

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<sup>248</sup> This one expects would also be the case for all the other professions which are firmly locked into the free-market/economic growth paradigm.

of being sustainability defaulters. The engineering profession is not only associated with, but is often seen to be instrumental in many of the environmental negatives which are said to flow from the free-market economic system.<sup>249</sup> Notwithstanding this argument, the popularity of the concept of sustainable development has ensured that most of the learned societies that exist within the engineering fraternity, have adopted it as a professional objective in their constitutions or missions. What thus remains is to clarify exactly what is meant by sustainable development, and then what its implications are for engineering practice. Given the importance that this study places on sustainable development as the development strategy for our times, one suspects that it can be no other but a first principle of engineering. If nothing else, the elevation of technology to a sustainable development dimension in its own right, can only underwrite this conclusion. Towards this end, and looking ahead, one can see that this study will need to, *inter alia*, consider:

- the implications of using sustainable development as a first principle in engineering,
- how engineering codes of conduct are (and maybe should) deal with the concept of sustainable development,<sup>250</sup> and
- how sustainable development is (and should be) dealt with in the professional education of engineers.

To conclude this sub-section, it may be noted that this study is not, despite its engineering bias, dogmatically committed to the inclusion of technology as a fourth dimension of sustainable development. The three-dimensional model of sustainable development allows, as has been said, adequate space for the expression of engineering objectives, and, given the wide ranging popularity of the three-dimensional model, it might simply be expedient to accept it for the moment. Some commentators apply some slight modifications to the three-dimensional model to reflect more explicitly the role of technology in society, as shown in Figure 6.7. In this figure the economic dimension is re-conceptualised as a *techno-economic* dimension, which underlines, firstly, the significant role of technology in the realisation or not of sustainable development, and secondly, the close relationship between the economy and engineering.

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<sup>249</sup> For example, the economic growth paradigm demands increased physical infrastructure, and that falls directly into the central work domain of engineers.

<sup>250</sup> This is reminiscent of Hardin's conceptualisation of administrative law (1995: 334).

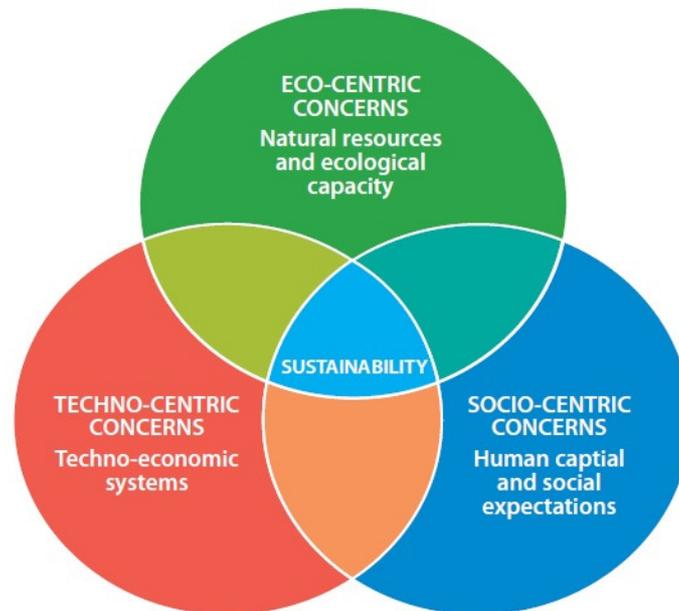


FIGURE 6.7: SUSTAINABLE DEVELOPMENT WITH A TECHNO-EMPHASIS  
(Dodds & Venables, 2005: 7)

Having thus, notwithstanding the arguments for a fourth technological dimension, settled on a three-dimensional model of sustainable development, it will appear somewhat incongruent when, in the next sub-section, a contrary position is taken by arguing for the inclusion of a fourth dimension, this time the so-called *institutional* dimension. However, valid reasons will be put forward for the inclusion of this dimension, and if this four-dimensional model is then accepted, the newly introduced institutional dimension might itself be a natural home for many of the technology/engineering objectives.

### 6.3.2 The institutional dimension

The three-dimensional model of sustainable development has very much become a standard in sustainability literature. Often, as has been shown, it is represented as three intersecting circles (see Figures 6.3 & 6.7), and also at times it is referred to as the three pillars of sustainable development, or as the triple bottom line. As could be expected the review carried out in Chapter 5 of various sets of principles of sustainable development, yielded principles which appeared to fit reasonable comfortably into one of the three said dimensions of environmental, social or economic sustainability. But it was also then found that some of the principles fitted more conveniently into an additional fourth dimension, that of *institutional* sustainability. (See

the summary of principles as drawn up in Appendix C14.)

The justification for this fourth dimension rests on the view that however laudable the principles may be that are to be found in the environmental, social and economic dimensions of sustainable development, none of them will be of much use unless they are carried forward into practice. And so that is what this fourth dimension is about: creating institutional capacity for the implementation of the principles of sustainable development. Clearly the institutional dimension is founded not so much on a theoretical break-down of the concept of sustainable development as on the meeting of a practical need.

As said, many of the principles from the sets of principles reviewed earlier, seem to belong to this fourth dimension. But it is not only this observation that is used to justify the inclusion of institutional sustainability as the fourth dimension of sustainable development; this four-fold dimensioning is also in accord with the categories or dimensions put forward in a number of publications, particularly some written from an economic perspective. In these publications the sustainable development dimensions are often expressed in economic terminology as various types of *resources* or *capital*. These have been identified as (Burger & Mayer, 2003: 16; Sigma Project, undated: 4):

(a) environmental resources:

- resources derived from nature

(b) economic resources:

- manufactured capital, i.e. man-made assets such as physical infrastructure
- financial capital, i.e. cash, sales shares, etc.

(c) social resources:

- human capital, i.e. manpower
- social capital, i.e. the institutions, knowledge and regulations with which we manage society.

Obviously the environmental resources refer to those renewable and non-renewable resources and services that humans obtain from the natural environment, and as such are collectively referred to as the environmental dimension. Logically the economic resources from the above list constitute the economic dimension, and while in economic circles it might be convenient

to split this dimension into man-made (or manufactured) and financial capital, such a sub-division is not generally applied to the economic dimension of sustainable development, and hence it will also not be taken further in this study. On the other hand, the split of the social resources into the two categories of human capital (people and their abilities) and social capital (social relationships and structures) is paralleled by a similar sub-division of the social dimension of sustainable development in a number of sources. This sub-division results in a (new) social dimension, of somewhat reduced scope, which corresponds to the human capital category in the above list, and a new institutional dimension which corresponds, in turn, to the social capital category above. Thus it is that the institutional dimension can be equated to a type of capital, and like all types of capital, if it is not used effectively the system as a whole suffers. (A very real analogy to this conceptualisation is to be found in the situations, all too prevalent in South Africa, where municipalities fail to deliver on their mandates, principally because they lack the institutional capacity to do so.) The institutional dimension thus allows scope for specific emphasis on developing the capacity in society to deliver on the goals of the other dimensions of sustainable development. Its dimensional goal can thus be simply framed as *capacitation*.

The correspondences between the sustainable development dimensions used in this study and the categories employed by Burger and Mayer (the GTZ categories), and, also those found in the so-called *Sigma Guidelines* are reflected in Table 6.3.

TABLE 6.3: COMPARISON OF CATEGORIES OF SUSTAINABILITY

<b>Sustainable Development Dimensions</b>	<b>GTZ Categories</b> (Burger & Mayer, 2003: 16)	<b>SIGMA Categories</b> (Sigma Project, undated: 4)
Environmental sustainability	Environmental resources	Natural capital
Social sustainability	Social/human resources	Human capital
Economic sustainability	Economic resources	Manufactured & financial capital
Institutional sustainability	Social capital	Social capital

Some others sources not only support a fourth dimension of sustainable development but also

underline its importance. For example, Rogers, *et al.* contend:

Many feel that the most important of the four principles of sustainable development is institutional safeguards, because it enables the other three (economic sustainability, social sustainability, and environmental safeguards) to be in place. Institutional safeguards consist of good governance, disclosures of information, anticorruption, and inspection policies. (2008: 162-163)

It is thus here concluded that the four-dimensional model as described in this sub-section, is an adequately founded, and a convenient way of conceptualising sustainable development. For these reasons, the sustainable development framework being proposed in this study, will be developed around the idea of four, instead of three, dimensions.

## 6.4 CONCLUSION

It needs to be reiterated that the dimensions of sustainable development are categories of convenience rather than principle. Quite often issues arise which overlap from one dimension into another. For example, while global warming might be considered a problem within the natural environment, it is not difficult to see that it has social, economic and institutional ramifications. But, having decided on a four-dimensional model of sustainable development, it is now opportune to return to a discussion of the principles of sustainable development, to see how these four dimensions can assist in ordering these principles, and thereby giving more structure to the framework of sustainable development that is being proposed in the study.

## CHAPTER 7

### A SUSTAINABLE DEVELOPMENT FRAMEWORK

[A] **framework** [is] ... 1 an essential supporting structure. 2 a basic system.<sup>251</sup>

The view that sustainable development could be better understood and described through a framework, instead of through a concise definition, was put forward in Chapter 5. The framework, in this context, is a system, or supporting structure, of *inter alia*, values and principles. The first steps in developing this framework were taken in Chapter 5 (see Figure 5.1), but then the process was deferred for a while, to allow for a more thorough consideration of the dimensions of sustainable development, as these were to be used as building blocks in the framework. Having now completed the discussion on the dimensions of sustainable development (in Chapter 6), it is time to continue, in this chapter, with a further fleshing out of the framework. Firstly the interrupted discourse on the principles of sustainable development will be resumed. Then, as further categories in the framework, the measurement of sustainable development and sustainability applications will receive attention. The chapter will be concluded with a brief review of the first prototype of the sustainable development framework.

#### 7.1 REVISITING THE PRINCIPLES OF SUSTAINABLE DEVELOPMENT

In the previous chapter it was decided to adopt a four-dimensional model of sustainable development, the dimensions being those of environmental, social, economic and institutional sustainability. The process of reviewing a number of different sets of principles of sustainable development (in Chapter 5), is now finalised by separating all the principles into four categories, each one of which corresponds with one of the abovementioned dimensions (see Appendix C14). While some principles seem to be of a more general and overlapping nature, most of the principles can conveniently and logically be grouped under one of the mentioned dimensions. The principles in the first three categories are aimed at promoting the respective objectives of environmental integrity, social cohesion and economic vitality, but the principles in the fourth category are more appropriately (as discussed in §6.3.2)

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<sup>251</sup> *Reader's Digest Oxford Complete Wordfinder*, 1993. London: Reader's Digest Association Limited.

considered to be enabling principles – that is to say principles, the application of which, will promote or realise one or more of the objectives of the other categories.

It is important to be reminded again that the dimensions of sustainable development should not be viewed as impermeable categories, but rather as convenient descriptors, the application of which is intended to enhance one's understanding of sustainable development, and its multi-faceted nature. Some of the principles could, it seems, be categorised equally well into a category other than the one in which they appear in Appendix C14, and in many instances the principles do in any case have implications that stretch across two or more dimensions. For example, a principle such as poverty alleviation, has clear roots in both the *social* and *economic* dimensions, but additionally one may also argue that appropriate *institutional* arrangements are needed to effectively relieve poverty, and furthermore that even the health of the natural *environment* could be linked to conditions of poverty. The fact that Gagnon, *et al.* (2009) made use of multi-dimensional categories in their summary of sustainable development principles underscores that, at least in some cases, the categorisation of principles into dimensional categories is debatable, subjective and somewhat arbitrary. And even in the case of those principles that seem to slot very comfortably into only a single dimension, the notion of holism insists that no dimension can be completely isolated from the others. To summarise: the dimensional categorisation of principles is often based on convention or preference, and as such should not be seen as fundamental or very critical.

Returning again to the categorisation adopted by Gagnon, *et al.* one reads that their approach was based on the three pillars (or dimensions) of sustainability: environment, economy, and society. Seven categories were selected for the analysis: one for each of the three pillars, one for each of the three links between pairs of pillars, and a final one relating to the three pillars simultaneously. [However], the pillars were broadly delineated in order to provide exclusive, but flexible, categories. (2008: 1460)

Clearly Gagnon, *et al.* also understand that the dimensional categories are “flexible”, but even then they feel a need to create multi-dimensional categories; a need that is circumvented in this study by simply insisting, repeatedly, that the dimensions are not mutually exclusive divisions. Evidently also, Gagnon and his co-workers are happy with a three-dimensional interpretation of sustainable development. This is not considered a critical departure from the four-dimensional model being proposed in this study, given the flexibility with which the dimensions are interpreted.

The objective of the summary of principles presented in Appendix C14, is to identify the most common principles of sustainable development, as extracted from all the sets of principles reviewed, with the intention that these will in turn, lead to the formulation of a final set of principles, which are authenticated by their wide-ranging sourcing, and hence can be said to be authoritative and broadly accepted (at least among sustainable development theorists). In formulating the final set of principles, a decision will have to be made between having many detailed principles, as opposed to having a few broadly based principles. It may be observed that there is a considerable variation in the number of principles in each of the sets of principles reviewed. The numbers vary from 5 to 53, which indicates that some sources aim at a high level of specificity by including much detail into their principles (and thus possibly running into the dangers of repetition and overlap, while also possibly being somewhat irrelevant to a broader readership), while in other sets the aim is rather to identify a fewer number of broadly applicable principles. The advantage of a smaller number of principles has already been discussed previously, and hence the final set of principles to be put forward in this study, will follow this guideline, which also correlates with the approach of Gagnon, *et al.* (2009), who whittled 212 principles from 13 sources down to 15.

What also became apparent from the review of the various sets of exemplar principles, was that some principles were accorded more importance than others, and that some could be regarded as being subsidiary to other, more basic principles. This could in some cases be detected implicitly in the order or layout of the principles, but in other cases it was explicitly stated. Also evident was the fact that some principles were more widely focussed and others more narrowly. The principles to be included in the sustainable development framework being proposed in this study, which are on a higher level, or more broadly based, will be denoted as *foundational* principles. They are to be regarded as representing the “essence” of sustainable development. The remaining principles included in the framework, will be denoted as *subsidiary* principles. They will be categorised under one of the dimensions of sustainable development, the one which seems the most appropriate to the principle in question, but all the while bearing in mind that the dimensions are categories more of convenience than of “essence”. It should also be accepted that there is some level of subjectivity in deciding where a principle from a reviewed set fits; the same principle can be worded quite differently from one set to another. Also the way in which principles are articulated may mean that some of the reviewed principles may be seen only as components of others, or otherwise a reviewed principle may have been expressed so broadly in the set from which it originates that in the summarising process it is taken to

represent two or more principles.

### 7.1.1 The foundational principles

The first principle in Appendix C14, the *respect for life* principle, is in fact regarded as so important by the compilers of the *Caring for the Earth* principles that they designate it as “the founding principle [which] provid[es] the ethical base for the others” (IUCN, UNEP & WWF, 1991: 9). The biocentric doctrine of the ethical model for sustainable development, as proposed in Chapter 4, underwrites, as far as this study is concerned, the respect for life principle. This biocentric doctrine is considered so important<sup>252</sup> that it features twice in the proposed sustainable development framework. Firstly it emerges as a *value* in the framework, designated as *reverence for life*, from which position it provides the ethical rationale for the values of beneficence and fairness. Secondly, it also serves as a *foundational principle* in the framework, designated *the respect for life* principle, and as such, it provides the founding ground for other subsidiary principles, notably those dealing with human rights, disadvantaged groups and cruelty against animals. It is suggested here that the *Caring for the Earth* compilers would be more than pleased with this approach.

In some of the exemplar sets of principles reviewed, the respect for life principle was associated with a narrower focus on *human* life, which resulted in an overriding commitment to apply sustainable development to the benefit of human beings. While this does not necessarily imply that the non-human components of the environment lose all value, it does relegate them from a level of intrinsic value to that of instrumental value. This study takes the view that this anthropocentric bias is deficient and that a biocentric approach, as has been argued, is more wholesome and justifiable (see §4.2.4). And if this approach is considered somewhat misanthropic, it may be stated that in the remaining principles that are to be included in the framework, there is ample evidence of the importance placed on human welfare.

Notwithstanding the fact that the biocentric ethic, which accords intrinsic value to all forms of life, is included as a basic value and a foundational principle in the proposed sustainable

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<sup>252</sup> Bear in mind that it is the criterion of *life* that distinguishes between what is accorded intrinsic value and what is accorded instrumental value.

development framework, the interpretation of this ethic in practice is moderated by pragmatism, another tenet of the ethical model developed in Chapter 4. In many practical situations where one encounters competing values, a theoretical impasse may ensue, particularly if the values are intrinsic values. In such situations the pragmatic approach, which does not insist on absolute theoretical clarity, will allow practical judgement and field knowledge to inform the way forward. For example, while the biocentric doctrine may ask theoretical questions about the consumption of meat, the pragmatic approach, given the futility of insisting on a full scale societal conversion to vegetarianism,<sup>253</sup> may instead focus, for the moment, on the ethical control of the production of meat. Following through on this approach then, practices such as chicken battery farming, which may be acceptable from an anthropocentric perspective, will remain seriously problematical from the biocentric standpoint. A biocentrist may pragmatically concede to the consumption of chickens, but he or she will still insist that in other respects chickens be humanely treated. While it is thus reaffirmed that the principles of the proposed sustainable development framework may require pragmatic interpretation, this by far does not mean that these principles are irrelevant or to be taken lightly, and certainly the foundational principles, in particular, must be accorded a large degree of axiomatic authority.

In this light, and based on the wording from *Caring for the Earth* (IUCN, UNEP & WWF, 1991: 9), the first principle selected for the proposed sustainable development framework is:

***The respect for life principle***

*The founding ethic of sustainable development is respect and care for the community of life.*

Moving on, the next principle of sustainable development to be extracted from the review of the various exemplar sets of principles (see the summary in Appendix C14), is the principle of *holism*. In a number of the sets of principles the reference to holism is implicit or limited to only some aspects of holism. However, for a number of theorists such as Leopold, Callicott and Rolston (III), holism is a basic principle. For this reason as well as for the fact that it is considered a basic tenet of the ethical model for sustainable development, as outlined in Chapter 4, it is here considered to be a foundational principle of sustainable development. The

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<sup>253</sup> Without wishing to get bogged down in a theoretical debate, largely irrelevant to the objectives of this study, the academic question could be asked: can a vegetarian still be a true biocentric?

following discussion will attempt to lend further justification to this appraisal.

In 1996 an international group of sustainable development experts (including staff of the International Institute for Sustainable Development), meeting at the Study and Conference Centre of the Rockefeller Foundation in Bellagio, Italy, produced a set of principles for the assessment of sustainable development that are widely known as the Bellagio Principles. The first of these principles stresses the importance of a clear *vision* and *goals* for sustainable development (concepts that have already been considered as integral to the sustainable development framework that is being proposed in this study), and then the second of the Bellagio principles deals with holism descriptively. It states:

Assessment of progress toward sustainable development should:

- include review of the whole system as well as its parts
- consider the well-being of social, ecological, and economic sub-systems, their state as well as the direction and rate of change of that state, of their component parts, and the interaction between parts
- consider both positive and negative consequences of human activity, in a way that reflects the costs and benefits for human and ecological systems, in monetary and non-monetary terms. (Hardi & Zdan, 1997: 2)

In briefer terms the holism principle can be said to simply proclaim the interconnectedness of everything. Holism has been an underlying theme, which has surfaced from time to time in this study. In Chapter 1 attention was drawn to the fact that the traditional interpretation of the concept of the environment, which focussed exclusively on the *natural* environment, might in many instances be inadequate, and that then a more inclusive interpretation, which also took the *social* environment, in its many manifestations, into account, could be more appropriate. In Chapter 2 an inclination to expand the circle of moral considerability to not only include human beings, but also sentient beings in the animal liberation approach, and then all forms of life in the biocentric approach, and finally to include the whole of the planet in the ecospheric approach, reflects attempts to be more and more holistic. And then in this chapter, as has been mentioned, it has been possible, in summarising the various exemplar sets of sustainable development principles, to extract the holism principle, either in explicit or implicit form, from most of them. (The mere fact that in a set of principles reference is made to the simultaneous consideration of the environmental, social and economic dimensions reflects, in accordance with the second Bellagio principle, as quoted here above, holistic thinking.) But for some the question may remain – is the importance attached to the holism principle justified? To get

closer to an answer, further consideration of the origin and nature of holism is merited.

The concept of holism was coined by the former South African Prime Minister, Jan Smuts when he published a book on the topic in 1926. In stressing its foundational nature, he expressed himself as follows:

The whole-making, holistic tendency, or Holism, operating in and through particular wholes is seen at all stages of existence, ... With roots in the inorganic, this universal tendency attains clear expression in the organic biological world, and reaches its highest expressions and results on the mental and spiritual planes of existence ... *Wholeness is the most characteristic expression of the nature of the universe in its forward movement in time.* (Smuts, 1999: 109 [emphasis added])

Being a keen amateur botanist Smuts' theory on holism had its roots in biology, and thus, by analogy with biological organisms. He asserted that in this theory the whole

consists of parts, but it is more than the sum of its parts, and if these parts are taken to pieces the [whole] is destroyed and cannot be reconstituted by again putting together the severed parts. ... Wholes are dynamic, organic, evolutionary, creative. (Smuts, 1999: 111-114)

Smuts saw evidence of the holism principle being expressed on different planes or from different perspectives. A particular holism perspective which may not be explicit in the above quotations, but one that is inherent to many sustainability discourses, is that of a future perspective, or temporal holism. The GTZ principles, one of the exemplar sets of principles discussed previously, addresses holism through what, in that set of principles, is called the coherency principle. And then the future perspective is addressed through what is called the temporal coherency (Burger & Mayer, 2003: 26-31). In simple terms, temporal coherency aims to understand the needs of the present in terms of the actions of the past, and to integrate the actions of the present with the needs of the future. In this context the holism principle embraces the concern for future generations that appears in that iconic definition of sustainable development from the Brundtland report (WCED, 1987: 43). The GTZ document also speaks of vertical coherency, a hierarchical type of holism, which it discusses in terms of co-operation between different levels of government, but which could equally well apply between organisms (and food chains) within ecosystems. Horizontal coherency (another type of holism) focuses (according to the GTZ principles) on consistency between sectors or disciplines, such as for example between conservation and mining, or in academia between say the environmental and engineering disciplines. Clearly there are many ways of looking at holism, and in this study it

is the broad understanding of holism that is aspired to. As has already been suggested holism simply represents the *interconnectedness* of everything.

It may be noted that the holistic principle, in particular its broad interpretation, has its detractors too. Daly, for example, criticises the holistic conception of sustainable development which includes environmental, social and economic considerations. He argues,

One way to render any concept innocuous is to expand its meaning to include everything. ... Any definition [of sustainable development] that excludes nothing is a worthless definition. (1996: 9)

For Daly then the definition of sustainable development is simply “development without growth beyond environmental carrying capacity” (1996: 9). He thus narrows his focus essentially to *ecological* sustainability, and to then include social considerations, for example, into the concept of sustainable development is, according to his line of thinking, to weaken this focus.<sup>254</sup> While this study will accept that in sustainable development ecological sustainability is of paramount importance, it will at the same time, in line with many other approaches, insist that development that is insensitive to social and economic concerns is *not* sustainable. In short, it is here asserted that a broad perspective of holism is not only a desirable, but also a necessary requirement of sustainable development.

Often there may be a natural tendency, depending on the discipline of the specialist, the objectives of the developer, the interests of the community, the availability of reliable data or measures of sustainability, etc., to interpret sustainable development narrowly, maybe in terms of one dimension only (*à la* Daly). And while theoretically it may be argued that sustainable development is only really achieved when the objectives of *all* the dimensions of sustainable development are simultaneously optimised, many theorists recognise that trade-offs between various objectives are inevitable (Harris, 2003: 1-2). Thus it may be that a full holistic stance has, for any of a number of reasons (including those mentioned above), to be relinquished, in order to allow practice to proceed on the basis of the best available conjunction of achievable objectives. Notwithstanding such a pragmatic orientation, at least on a theoretical level, the holism principle should infuse all thinking around sustainability.

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<sup>254</sup> This is not to say that Daly is unaware of the social and economic dimensions. Indeed, being an economist, economic issues are his forte. He simply interprets *sustainable development* more narrowly, then considers issues such as equity, efficiency and sufficiency as additional considerations.

It is argued here that many of the problems that sustainable development tries to address, arise from a fragmented understanding of the world. The mechanistic/scientific world-view tries to decompose complex issues into smaller problems which can be solved by singular, short term approaches. However the continuing persistence of environmental problems such as global warming gives the lie to this approach. What is needed is a holistic perspective. If sustainable development is to become a successful strategy, holism will have to be a basic principle of it.

Thus, based on the perceived need for inclusive thinking in a number of areas, the second principle to be included in the proposed sustainable development framework is:

***The holism principle***

*The interconnectedness of everything is fundamental to sustainable development. It is expressed, inter alia, through:*

- *the interdependence of life*
- *inter-generational concern*
- *long-term thinking*
- *softening of spatial boundaries*
- *broad-based education*
- *multi-disciplinary practice*
- *integrated planning.*

The next principle is in fact an extension of the principle of holism, but it is so uniquely part of sustainable development that it is presented as a separate foundational principle, and is called, perhaps not unsurprisingly, the *sustainability* principle.<sup>255</sup> In essence it recognises the dimensions of sustainable development, and as has been repeatedly mentioned, the need for their holistic consideration, and importantly and implicitly, also their hierarchical order, as it is expanded on here below.

While often in practice, for reasons already mentioned, the focus may be on only one or two dimensions, the holistic principle not only requires that all the dimensions be considered, but also that this be done in an integrated way. This brings into question the popular depiction of sustainable development as the intersection of three spheres of influence (see Figures 6.3 &

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<sup>255</sup> There is obviously the possibility of some confusion between the name of this principle and the general heading of 'sustainable development principles', and for that reason this principle is here called the *sustainability* principle, even though, in general, these terms, *sustainability* and *sustainable development*, are often used synonymously.

6.7), and where, because the intersecting parts of the circles are relatively small, the impression that there are large areas of the three spheres of influence that are independent of each other, is inevitable. This impression, as well as the reductionist approach underlying such diagrams, carry the danger that sustainable development, thus perceived, may underestimate the interdependence between the three dimensions, and also view them *non-hierarchically*. This misconception may also be evident in a previously mentioned approach, which many companies now quite commonly endorse, the approach of the so-called ‘triple bottom line reporting’. This designation derives from the fact that, in their annual reports, companies not only report on the financial performance of the company, but also on their social commitments and environmental impacts. While in principle this is good, the lack of integration between the three ‘bottom lines’ could lead, firstly to the economic bottom line holding sway over the other two, and secondly to an overall dilution of the sustainability performance of the company. Norman and MacDonald expressed this concern as follows:

The concept of a Triple Bottom Line in fact turns out to be a “Good old-fashioned Single Bottom Line plus Vague Commitments to Social and Environmental Concerns”. And it so happens that this is exceedingly easy for almost any firm to embrace. By committing themselves to the principles of the 3BL [triple bottom line], it sounds like companies are making a more concrete, verifiable commitment to CSR [corporate social responsibility] and sustainability. And no doubt, many are. But it also allows them to make almost no commitment whatsoever ... At best, a commitment to 3BL requires merely that the firm report a number of data points of its own choosing that are potentially relevant to different stakeholder groups – typically in the form of a glossy 3BL report full of platitudinous text and soft-focus photos of happy people and colourful flora. (2004: 256)

It thus appears that sustainable development needs to be perceived differently in that the integration between the three spheres of influence, and their interdependence, needs more emphasis. In addition, the primacy of the environmental dimension, referred to in §6.2.3, also needs to be highlighted. This insight recognises that for any development to be considered sustainable, it must in the *first* instance not exceed the limits imposed by the natural environment. To repeat Daly’s definition:

Sustainable development ... is development without growth – that is without throughput growth beyond the regeneration and absorption capacities of the environment. (1996: 13)

Based on this understanding an improved depiction of the dimensions of sustainable development is that shown in Figure 7.1. In this figure the economy is a sub-system of society,

which in turn, is a sub-system of the environment. Therefore both society and the economy must operate within the physical boundaries set by the environment. Or, to phrase it differently, while an action can be economically feasible, and socially acceptable, it is in the final instance only sustainable if it is also *environmentally* or *ecologically* sustainable. In a loose sense it may also be suggested that the two depictions of sustainable development (Figures 6.3 and 7.1) represent weak and strong sustainability respectively, where in the first instance, one can readily visualise the possibility of substitution (of resources) between the separate dimensions, but where in the second instance of nested dimensions this is not the case.

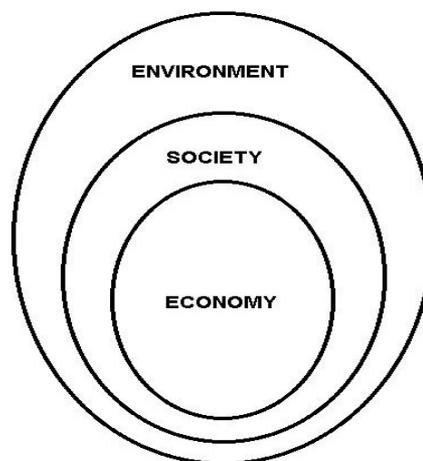


FIGURE 7.1: THE ECONOMY AND SOCIETY CONSTRAINED BY ENVIRONMENTAL LIMITS (After Herz, 2009: 19)

The dependence of the economy and society on the natural environment is in effect the carrying capacity principle, and the importance of this hierarchical interdependence is such that it should be elevated to the level of a foundational principle.

Another representation of sustainable development which underlines the importance of the environmental dimension, is that shown in Figure 7.2. Here sustainable development is depicted as a triangle with the natural environment as its base. This reinforces the understanding that nature and the resources that it provides are foundational to sustainable development.

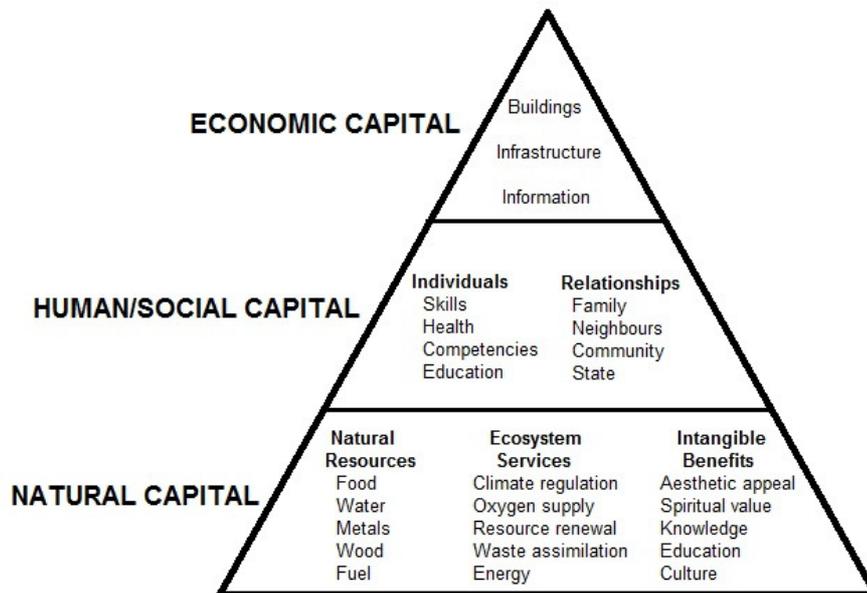


FIGURE 7.2: THE PYRAMID OF SUSTAINABILITY  
(After Sogesid, undated: 4)

The nested understanding of sustainability (as depicted in Figure 7.1) may be expressed by means of three precepts which in hierarchical order are represented by the three spheres of influence from the outside in:

1. **Sustainable Scale** – defined by the Earth's finite limits, in which efficient allocation and just distribution must be maintained, if a stable, steady-state economy is to be attained [Consider this as the environmental dimension.]
2. **Just Distribution** – that allocates the Earth's finite resources so that all can live with respect [Consider this as the social dimension.]
3. **Efficient Allocation** – the basis of traditional economics, which maximizes the utility of resources through a properly functioning marketplace. [Consider this as the economic dimension.] (Herz, *et al.*, 2009: 21)

In conformance with the four-dimensional model of sustainable development, as was discussed in the preceding chapter, a fourth precept (aimed at improving practice) may be added to the above list. This would be the precept of **effective governance**, which corresponds to the dimension of institutional sustainability, which relates to institutional capacity. (This fourth dimension may be depicted graphically as supporting the nested format of Figure 7.1 in an attempt to convey its enabling role. See Figure 8.1)

And so the third foundational principle to be included in the sustainable development framework is:

***The sustainability principle***

*Development is only sustainable if capacity is created to secure the integrated realisation of the following objectives:*

- *environmental integrity*
- *social cohesion*
- *economic vitality.*

The objectives of *environmental integrity*, *social cohesion*, *economic vitality* are representative of three of the dimensions of sustainable development, and it may be assumed that the previously discussed nested hierarchy inherent in these dimensions, is implicit in their *integrated* realisation, and in the order in which they are given. Furthermore, the directive that *capacity is to be created* to secure the realisation of the dimensional objectives may be taken as an implicit reference to the fourth dimension, the institutional dimension.

The remaining discussion will now focus on the principles that are characteristic of each of these four dimensions, and which when collectively applied in each dimension amount to the realisation of the above dimensional objectives. These principles will here be distinguished as *subsidiary* principles. It will quickly be apparent that many of the principles have implications that stretch across two or more dimensions, and so it must again be borne in mind that the inclusion of a particular principle under a specific dimension is to some extent subjective. In fact, as has been noted, Burger and Mayer see the five principles in their model operative across all three dimensions (2003: 17). That however is here considered as going too far; and for the purposes of the proposed sustainable development framework, the more conventional approach will be followed, with the subsidiary principles being categorised into the four dimensions. (In the discussion of the subsidiary principles that is to follow, the order used is roughly that which is employed in the summary of sustainable development principles in Appendix C14.)

### **7.1.2 Subsidiary principles: Environmental dimension**

The first subsidiary principle to be considered in the environmental dimension is here designated as the *carrying capacity* principle. This principle follows logically from the

observation that the world is a closed system, and that as a consequence of which, a continued proliferation of natural resource use can lead to the collapse of such resources. Arguments have been made that while the physical world is limited, human ingenuity is not, and hence that, through human enterprise natural resource use will become increasingly efficient, and suitable alternatives for diminishing resources will be identified, thereby extending, if not bypassing the carrying capacity limits. While not negating this argument – it is after all the only feasible approach towards the use of non-renewable resources such as fossil fuels – it can however only have limited validity, particularly when the ‘resources’ in question are the complex life support services supplied by the natural environment, and for which there are no feasible substitutes. For example, the complex role played by the so-called greenhouse gases in moderating the climate of the world, a role now under threat of destabilisation due to global warming, can not realistically be substituted by any other anthropogenic process.

Too much must not be read into the fact that while Daly (1991b: 5; 1996: 13) considers the carrying capacity principle foundational, it is here categorised only as a subsidiary principle. In the present context ‘subsidiary’ simply means that the principle applies mainly (but not exclusively) to the environmental domain. It has however already been explained, that in the nested model of sustainable development, the environmental dimension (and hence the carrying capacity principle) enjoys primacy, and this hierarchy is implicitly recognised in the sustainability principle. For the purpose of the proposed sustainable development framework then, the first of the subsidiary principles in the environmental dimension, can now be expressed as follows:

***The carrying capacity principle***

*Natural resource use must be contained to be within the environmental regenerative and absorptive capacities of the earth. This requires the*

- use of renewable resources not to exceed the regenerative capacity of the environment*
- minimisation and the eventual substitution of non-renewable resource use*
- minimisation of waste generation to within the assimilation capacity of the environment.*

Before leaving the carrying capacity principle it might be instructive to consider its multi-dimensional character in order to underline the point that the categorisation of sustainable

development principles into dimensional categories is not a fundamental issue. It should not be allowed to dilute one's understanding of the principles, nor should it give the impression that the scope of any principle's application is limited to a single dimension. Consider again the Ehrlich-Holdren identity presented in §1.2.3, and note that it expresses the load that humans place on the environment:

$$I = P \times A \times T$$

Where I = environmental impact

P = population

A = affluence (consumption per capita)

T = environmental impact per unit consumption use which is a function of the technology employed (Rodgers, *et al.*, 2008: 31)

In terms of the dimensions of sustainable development, the environmental impact, I, could be said to reside in the environmental dimension, where it can be rated against the environment's carrying capacity. The factor P belongs to the social dimension, the factor A is a socio-economic factor which involves both the social and the economic dimensions, and the factor T would resort under the technological dimension.<sup>256</sup> Thus one can see, in considering the carrying capacity principle, which nominally resides in the environmental dimension, that one also has to look at factors and influences arising from the other dimensions, and that it would be erroneous to think of the ambit of the carrying capacity principle as being limited to the environmental dimension only.

The next principle may be considered to be an extension of the carrying capacity principle in that it recognises specifically the important role that the natural environment plays in supporting and enriching human life, and that as a consequence there is a need to preserve it. This applies not only to the natural resources that were more explicitly the focus of the previous principle, but also to the non-consumptive use that nature has for humans. It provides, for example, ecological services, recreational opportunities and spiritual value. And if one leaves anthropocentric considerations aside, one could even argue for this principle simply on the basis of the intrinsic value of nature. In short, as nature is valuable, it needs to be protected, hence

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<sup>256</sup> The technology dimension was discussed as a possible fourth dimension of sustainable development in §6.3.1, and it was also suggested that technology could be part of the institutional dimension.

we have what is here designated as the *conservation* principle.

In our times nature has been under increasing threat. Indeed, as has been mentioned, it is the observed degradation of, and threats to nature that gave impetus to the development of the modern environmental movement over the last few decades. Hence one can also expect the concern in this regard to be an important focus area of sustainable development. From many sources one gets the message of alarming losses of biodiversity due to human impact. It is human activities in general, such as the practice of mono-culture agriculture, the expansion of human settlements, industrialisation, and simply soaring human numbers that are prime causes of the losses in biodiversity. Clearly, even if only for selfish reasons, there must be some attempt at the containment, and if possible the reversal of these losses. One response to this problem is the establishment of conservation areas, but even areas that have been set aside for this purpose are under threat. The integrity of many conservation areas is being assailed by activities such as human invasions, poaching and mining. More recently the development of eco-tourism has emerged as a potential ally in the fight against the degradation of the natural environment. Hopefully developing countries, particularly in Africa, can, even if largely for reasons of economic benefit, increasingly utilise this unique opportunity at their disposal.

Not always appreciated, but of crucial concern for humans, are the life support systems provided by nature. The stability of these systems over many years and their complexity may have contributed to them being taken for granted. Often those who have warned against the potential collapse of these life supporting systems have been labelled as prophets of doom and light made of their arguments. But it may be that the emerging effects of climate change will bring home to the world not only the seriousness of these problems, but also their intractability. In more localised situations the problems of water contamination and air pollution that could lead directly to human health problems, are abundantly in evidence. All such concerns should lead one to adopt a conservation ethic, which apart from the conservation of specific areas, could simply imply a wider respect for nature, which would inhibit the simply wilful or thoughtless destruction imposed on it.

***The conservation principle***

*Nature is of value, both to humans and in and of itself. To protect nature and natural systems a culture of conservation needs to be nurtured. This will include:*

- the conservation of biodiversity*
- the conservation of natural life support systems*
- the conservation of areas of natural uniqueness and beauty*
- the restoration of damaged natural systems.*
- being respectful of nature.*

Before moving on from the conservation principle it may be noted that, while the wording of the principle may seem to indicate that intrinsic value is accorded to all of nature, it is strictly speaking, only the living components of nature that enjoy intrinsic value. This is only mentioned in order to confirm that the biocentric ethic adopted earlier in this study is still in place. Of course this does not mean that the non-living components are outside the scope of this principle; because these components are of instrumental value to the organisms in nature, they too are worthy of conservation.

The next principle to be considered in this sub-section is the so-called *precautionary* principle. It should by now be obvious that the principles are not islands unto themselves, instead most have interconnecting threads with other principles. The precautionary principle can be regarded as an extension of the conservation principle, but as the latter was considered an extension of the carrying capacity principle, the precautionary principle may then also be considered related to the carrying capacity principle. This interrelationship between principles is not surprising as they are all intended to contribute to the realisation of the relevant dimensional objective.

The precautionary principle, a well-recognised principle of sustainable development, simply warns against using the lack of scientifically supported information as an excuse for not taking the necessary actions to preserve and protect the environment. As has been previously mentioned, natural processes and systems are complex, and in many instances the scientific theories used to explain natural phenomena are still immature and rudimentary. Because the scientific predictions around some environmental problems are clothed with a certain measure of doubt, there are those who object to expending resources in addressing these problems, as

they feel that this would be non-productive and wasteful. Often such objectors are techno-optimists who believe that, in time, the science around the problem areas will become more conclusive, leading to technologies that can deal with the problems on hand in more constructive and cost-effective ways. For example, those that oppose the Kyoto Protocol (implemented as an international action against global warming), will often claim that its costs far outweigh its benefits (Lomborg, 2001: 203-205). But, staying with the Kyoto Protocol for the moment, it could also be argued that there is more to it than simple economic efficiency. Reviewing the economic costs of the protocol, Grubb concludes:

Overall, Kyoto can be seen as a potent symbol of intent to control emissions, a basic regulatory framework with initial targets backed by a modest international price signal, and as a vast learning exercise. (2003: 186)

It must also be remembered that the potential damages to a country resulting from global warming, are not in proportion to the country's contribution to global warming, and that poorer countries are less able to counter its effects. Furthermore, some of the effects of global warming could be irreversible (such as, for example, species that become extinct). Clearly remedial action is required *sooner rather than later*. The precautionary principle is essentially a risk-averse approach, which is based on the belief that the costs one incurs in taking preventative action weigh less than the risks one is being exposed to by avoiding such preventative action. And so, in this study, in line with many other august bodies, the precautionary principle is fully endorsed. It is here presented in wording borrowed from the OECD principles.

***The precautionary principle:***

*Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.*

In attempting to explain the rationale of the next principle in the proposed sustainable development framework, the carrying capacity principle is again used as a starting point. This principle makes the assumption that it is possible to determine the carrying capacity of nature. Indeed in many cases this is not so easy, and furthermore, in other cases, while the exact value of the limit may be unclear, it seems likely that it has already been exceeded. Society, it seems, cannot, or is not willing to take the drastic measures that may be necessary to return to a position that is within the limits set by nature. For example, it has been argued that if all the people on the earth were to live according to the standards of the USA it might need the

capacity of two extra worlds to meet this demand (Wackernagel & Rees, 1996: 15), and yet it is highly unlikely that, on the one hand, Americans will unilaterally reduce their standard of living (or levels of consumption), or on the other hand, that developing nations will order a reduction in their population growth. It is situations like this that prompt the next principle, the *minimum impact* principle, which can, maybe somewhat cynically, be seen as a stop-gap measure to be put in place until humans are willing to take full responsibility for their environmental impact.<sup>257</sup> At best, it seems to promote an ethic of weak sustainability. But, in a more general sense, with the recognition of the inevitability of human impact on the natural environment, and recognising such technical difficulties as there may be in assessing the magnitude of this impact, this principle obliges humans to limit this impact to the minimum, if it cannot be avoided altogether. The minimum impact principle is here expressed in wording largely borrowed from the NEMA principles.

***The minimum impact principle***

*The ubiquitous human impact on the natural environment requires inter alia that:*

- pollution and degradation of the environment be avoided, or, where it cannot be avoided, it be minimised and remedied*
- the production of waste be avoided, or where it cannot be avoided, it be minimised and reused or recycled where possible, and otherwise disposed of in a responsible manner*
- negative impacts on the environment be anticipated and prevented, and where they cannot be prevented, they be minimised and remedied.*

In the exemplar sets of sustainable development principles that have been reviewed, the issue of human rights features prominently, even if only by the assertion that humans are the primary focus of sustainable development. However there is no corresponding emphasis on animal rights, at least not explicitly, and only in one set of principles is the issue of cruelty to animals raised. But if the founding principle of respect for life is to be taken to its fullest consequences, then one cannot avoid addressing the implications of this principle with respect to animals. In this study questions around enlarging the sphere of moral considerability, in particular whether animals should be included or not, and if they are included, if such an inclusion would apply to all animals, or maybe only to those who are sentient or self-aware, have all, to some degree,

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<sup>257</sup> It could be argued that if the carrying capacity principle is clearly and consistently applied, then the need for the minimum impact principle would disappear.

been overtaken by the acceptance of the biocentric ethic which accepts life as the criterion of moral worthiness. While the biocentric ethic, here expressed as the respect for life principle, insists that all forms of life are worthy of moral consideration, it does not necessarily insist that all forms of life are worthy of *equal* moral consideration. The notion of moral distance comes into play here. It appears that most theorists (and society too) would accept that human rights exceed animal rights, and that the rights of some animals may also exceed those of others, and that animal rights may exceed the rights of plants. But apart from this general statement, there however seems to be no clarity with respect to the finer detail of these distinctions. Sustainable development as a strategy needs to proceed even if there is still considerable ambiguity around the respect for life principle. It is likely that as society and the concept of sustainable development evolve further, so too more clarity may emerge around animal rights. Already the legal prohibitions against animal cruelty which are being enacted in many countries, present de facto evidence of an emerging animal rights culture. While animal rights appears to be a low key issue in the sets of sustainable development principles reviewed, it is felt that the increasing sensitivities towards animal rights need to be acknowledged here, and it is done by positing the *anti-cruelty* principle. Acknowledging that it covers an area that is still significantly indeterminate, the principle is deliberately phrased in simple terms, but undoubtedly questions will arise. For example, is the eating of animal flesh a case of cruelty or not? Questions of this nature cannot be resolved here, and, for the moment, a general principle, such as the one below, will have to suffice, and hopefully, in time, further clarity will emerge.

***The anti-cruelty principle***

*No animal should wilfully and arbitrarily be subjected to cruelty.*

### **7.1.3 Subsidiary principles: Social dimension**

The principles listed in this sub-section all attempt to promote the notion of *social cohesion*, which was formulated as a dimensional objective of the sustainability principle. It needs to be noted again that the following principles are not necessarily mutually exclusive. This is due, at least in part, to the wide and complex array of relationships that characterise modern human society.

The first of the principles to be discussed in this sub-section is the *fairness* principle. If the carrying capacity principle is basic to the environmental dimension, then the same can be said about the fairness principle with respect to the social dimension. In fact, as has been argued in Chapter 4, the fairness principle is very closely associated with the foundational ethic of beneficence, which is at the heart of the ethical model, that in this study, has been put forward as the ethical substructure of sustainable development. Thus fairness is in fact a foundational value, on par with beneficence, in the proposed sustainable development framework. The principle of fairness is simply a more practical elaboration of the foundational value.

As formulated in the proposed framework, the principle of fairness is simply a collective for all the rights that inhere in our humanness. In human society there are many declarations on human rights, including, for example, The Universal Declaration of Human Rights of the UN,<sup>258</sup> and the South African Bill of Rights (South Africa, 1996). While many will understand human rights to be inclusive of cultural, religious and environmental rights, these latter rights are each, for the sake of clarity, explicitly mentioned in the formulation of the fairness principle here below. This formulation also obliquely recognises natural resource limits, the premise of the carrying capacity principle, by calling for an equitable sharing of these resources. Less tangible resources such as developmental opportunities and access to information are also included. In the last instance it is also asserted that prejudice, persecution, oppression and religious intolerance are all incompatible with fairness.

***The fairness principle:***

*All humans are entitled to fairness in their interactions with each other. This includes*

- recognition of their human rights*
- recognition of their cultural rights*
- recognition of their environmental rights*
- equity in access to resources, opportunities and information for the present and future generations*
- freedom from discrimination based on prejudice*
- freedom from persecution and oppression*
- spiritual and religious freedom.*

The second principle in this sub-section, the *human dignity* principle, is essentially an expansion on the theme of human rights. It asserts that it is not only fair, but also a right

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<sup>258</sup> See: <http://www.un.org/en/documents/udhr/index.shtml> [Accessed 20 February 2011]

accorded to every human being, to live their life in dignity. Clearly some conditions in which humans may find themselves, such as dire poverty, for example, could impair their dignity, and hence their quality of life is below a level that is considered acceptable. In order to avoid these conditions there are certain minimum requirements that need to be met. And so it is argued that in order to preserve their dignity, human beings need to enjoy certain minimum levels of food availability, housing, health care, security and education. The need of family bonds refers to the 'space' that mothers, fathers, children, etc. need to adequately fulfil these familial roles. A worst case example might be where parents are forced, by conditions of poverty, to abandon their children. There can be no doubt that dire poverty is one of the main reasons why these minimum needs are not met. Many commentators, especially social scientists, see poverty as one of the main problems that needs to be addressed by sustainable development, and to a larger or lesser degree it plays a role in all of the other needs mentioned in the human dignity principle.

***The human dignity principle***

*All humans are entitled to have their basic needs met such that their human dignity is not impaired. These needs include*

- food*
- shelter*
- health*
- security*
- family bonds*
- education*
- employment*
- respite from poverty.*

Some might question the inclusion of employment as a minimum need, but there seems to be an illogicality in requiring minimum levels of education for everyone, if this cannot be followed up by employment opportunities where the skills and knowledge acquired through this education can be profitably used. It could also be asserted that unemployment represents some kind of deferred indignity, as it is through employment (with reasonable remuneration) that the scourge of poverty (and following on from that many of the other needs too) can be, if not fully met, at least alleviated.

The subjectivity involved in assessing the range and levels of these minimum needs is undeniable – what is acceptable to one person may not be acceptable to another. However this

subjectivity does not remove the relevance of the notion of minimum needs (that need to be met in order to preserve human dignity). For the present purposes, it is not necessary, in this statement of principle, to express the basic needs in terms of numbers, as may be the case with some of the Millennium Development Goals. At this level of the proposed sustainable development framework their listing should suffice, but conceivably at the lower levels, which are more practice oriented, more specific detail may be required. While conceptually sustainable development requires that the objectives in all of its dimensions need to be addressed without favouring any one dimension or objective, it will quite often simply be the nature of things on the ground, that the operationalisation of a few, or only one, of the sustainable development principles might be the focus of a particular action programme.

The next principle in the social dimension arises from the fact that as societies have modernised there has been a trend towards allowing ordinary citizens greater levels of say in the decisions that affect them. This trend has become formalised in what is here called the *participation* principle. While this principle is becoming increasingly established in Western countries, it is its abrogation, together with curtailment of other civil liberties, that characterise dictatorships. Thus, in this broader context, it can also be referred to as the democratic principle, and in this guise it will be subject to further discussion later under the banner of the institutional dimension.

On a more localised level the *participation* principle commonly finds expression in the process of public participation, also known as stakeholder engagement, which features prominently in environmental impact assessments (EIAs). While EIAs are normally limited to specific project proposals, the South African Government may be commended for its role in extending public participation into the areas of new policies and programmes. Proposed legislation is also routinely opened for public comment. The intensity of participation can range from being merely informed, through consultation, to maybe even participation in decision-making. While the participation principle, as formulated here, does not dictate at what level of intensity the participation should take place, in practice the higher levels of intensity are more time consuming, and this could compromise the objectives of expeditiousness and efficiency. It also needs to be emphasised that participation only becomes meaningful when participants have access to all the relevant information. Not only must all this information be made available, it

also needs to be understandable, which in turn involves the issues of literacy and technical proficiency. All of these matters suggest that, in practice, development proposals could experience lengthy delays, and that pragmatic trade-offs might be required. While such pragmatic approaches towards the application of this principle in practice may seem to be a blunting of its thrust, it needs to be confirmed that informed decision-making<sup>259</sup> is crucial, and that, in the last instance, participation at the level of the ballot-box, in democratic societies at least, remains sacrosanct.

***The participation principle***

*Humans are entitled to participate in decisions which affect their lives, and to this end effective communication and knowledge transfer are prerequisites.*

The next principle follows to some extent from the previous one. It is a fact that many members of society are disadvantaged to varying degrees in terms of their ability to become beneficiaries through their participation in development processes. But speaking more broadly, conditions of disadvantage could apply with respect to many of the benefits that are available to society at large. The reasons for being disadvantaged may vary from culture, through poverty and illiteracy, to unfair discrimination. In patriarchal societies it is women who are disadvantaged, and in poor societies it is, not to speak of the poor themselves, often the young who are deprived of benefits such as education, and also the old who are marginalised in terms of housing and health care. Minority groups of indigenous peoples living in modern, multicultural societies, suffer not only cultural impoverishment, but also language and knowledge restraints, which leads to unemployment and other social ills. In the South African past, the issue of race played a major role in disadvantaging people who were not classified as white.

After identifying possible reasons why certain groups in society may be at a disadvantage, the principle of *empowerment* is aimed not only at a removal of these reasons, but also at redressing the disadvantages that flowed from them. The ultimate aim is that all persons should enjoy equal societal and environmental benefits, irrespective of their social status or group affiliation. This principle can thus be seen as simply giving effect, once again, to the principle of fairness, particularly in situations where conditions of structural unfairness exist. The principle of

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<sup>259</sup> Informed decision-making means, *inter alia*, taking into account the feelings of the parties affected by the decision-making.

empowerment is predicated by the presence of conditions of disadvantage in society. Presumably, as the conditions of disadvantage and the need for redress are reduced, as a result of the application of this principle, the need for it will decrease correspondingly.

***The empowerment principle***

*All disadvantaged groups need to be empowered so that they may participate effectively in societal processes, and also so that they may enjoy full access to the available societal and environmental benefits. These groups include*

- women*
- the young*
- the old*
- indigenous peoples*
- marginalised racial groups.*

In modern times human rights have figured prominently on the moral stage, particularly as far as the West is concerned, and this moral emphasis has led to a culture in which self-assertion is held high. The adulation enjoyed by stars of the screen and the sports field is evidence of the premium placed upon personal success. In the business too, the goal of personal financial success, usually marked by the acquisition of a surfeit of consumer goods, is foremost. In the shadow of such role models of success a host of gurus in self-affirmation have emerged. On many fronts society is driven by the goals of material success and self-affirmation. In this rising tide of hubris and personal affirmation the moral virtues of service, duty and obligation have become somewhat muted.

The *responsibility* principle addresses the notion that with the accrual of rights there are associated responsibilities. It is in the environmental arena that these associations often remain conveniently obscure. For example the exploitation of common goods, such as fishing on the open seas, is seldom associated with the responsibility of the careful husbanding of the fishing stocks. Garrett Hardin (1995) attempted to show in his essay, *The Tragedy of the Commons*, how the lack of responsibility in the husbanding of common stocks can lead to their complete collapse.

When the issue of responsibility is taken seriously, it must be understood that the poor and powerless cannot have the same level of responsibility as do the affluent and powerful. This is often expressed as ‘common but differentiated responsibilities’, and it signifies that while all

humans have responsibilities towards the environment (which could be broadly interpreted in this context), the nature and extent of these responsibilities will be different for different groups. For example, the poor who might be heavily dependent on the natural environment for their day-to-day subsistence, cannot be expected to reduce their resource consumption (but they will still need to employ ‘wise use’ principles). The rich, on the other hand, could be expected to significantly reduce profligate resource consumption caused by materialistic lifestyles. In a similar vein differing national responsibilities between the countries of the North and those of the South can be justified. The general acceptance of the notion of differentiated responsibilities is evident in international agreements such as the Kyoto Protocol (Rodgers, *et al.*, 2008: 340).

Although responsibilities accrue across the spectrum from individuals to nations, the responsibility principle will, at this point in the framework, be limited to the level of individuals and communities. National and international responsibilities will be covered later in principles categorised under the institutional dimension, where the focus will be more on national and global issues. The argument for this separation lies in the fact that many environmental issues are large scale and seemingly outside the range of influence of individuals. But sustainable development still requires that each individual and each community take responsibility for their own contributions towards sustainability. This may range from the adjustment of purchasing patterns, through to more green garden practices and water saving strategies, to the separation of waste into recyclables and non-recyclables. While the adage ‘every drop counts’ applies here, it is also about cultivating a mind-set (maybe the beginnings of Sterling’s “ecological world view”(1990: 77)) that contributes to sustainable development on the broader front.

***The responsibility principle***

*All humans and societies have a common but differentiated responsibility to ensure that all their activities contribute towards sustainability.*

#### **7.1.4 Subsidiary principles: Economic dimension**

The pervasiveness of the economic paradigm in modern society is reflected in the phrase, ‘the bottom line’, which implies that the final criterion of acceptability for any development activity is an economic one. This criterion has, in more recent times, been amended to read ‘the triple

bottom line', and in this form, notwithstanding the criticisms against its facile application, it does reflect an appreciation for the environmental and social dimensions of sustainable development, in addition to the economic dimension. While some traditional economic principles remain valid in the triple bottom line approach, their applicability has to be re-interpreted in terms of the broader set of objectives that are prescribed by sustainable development. That is what will be attempted in this sub-section, taking as point of departure the summary of sustainable development principles as reflected in Appendix C14.

The first principle to be discussed here deals with economic efficiency. According to Rogers, *et al.*:

Economic efficiency can be defined as the organization of production and consumption such that all possibilities for increasing economic welfare have been exhausted. (2008: 265)

It has always been argued by free marketeers that markets, unfettered by government interventions, are best at delivering economic efficiency. But while market efficiency is an undeniable good, it does not necessarily equate to the maximising of human welfare. This is because the market only delivers allocative efficiency, a narrower concept which is associated with Pareto optimality, defined as the

allocation of resources such that no further reallocation is possible which could provide gains in production or consumer satisfaction to some firms or individuals without simultaneously imposing losses on others. (Rogers, *et al.*, (2008: 265)

In the broader picture decisions related to the distribution of income (equity) and the scale of the economy relative to the ecosystem, still have to be made, and according to Daly (1996: 52), these are essentially social decisions that are beyond the ambit of the market, as understood by neo-classical economists. In simple terms the market for neo-classical economists is focussed on economic objectives, and this could be to the detriment of whatever social and environmental objectives there may be in the broader picture. As a result many environmentalists have blamed the reliance on market dictates as being instrumental in advancing social inequity and environmental degradation. But the new breed of economists, the ecological economists, recognise these shortcomings, and they thus try to incorporate social and environmental costs into their market models so that market efficiency takes these costs into account. It may be debatable to what extent they are successful in this endeavour. Nevertheless, given certain provisos, as expressed here, the principle of *efficiency* remains a powerful

advantage of free markets, and as such it can be utilised (together with other objectives) to promote sustainable development.

***The efficiency principle***

*This principle requires that all resources be used as efficiently as possible. This requires progressive and innovative economic systems that recognise:*

- the value of market forces*
- the value of full property rights*
- the need for the inclusion of externalities*
- the limitations of resource substitution*

It is a major objective of sustainable development to promote human well-being, but it is not easy to establish what exactly is meant by human well-being. At least one would expect that human well-being requires that the basic or minimum needs of humans should be met. However the question now becomes what is meant by minimum human needs. Minimum needs as assessed by a middle-class citizen of the USA might be vastly different from that of a beggar in India. Such subjective judgements add to the difficulty of trying to pin down the notion of human well-being. In the face of this challenge the UN devised the Human Development Index, based on life expectancy, education levels and per capita GDP to serve as an objective, single figure assessment of human well-being (Rogers, *et al.*, 2008: 121-122). It is expressed as a value between zero and one. But in this range, what is an acceptable value? Again that decision will be subjective. A value of 0,8 is suggested in Figure 7.3, which reflects a comparison of the performance of countries across the world in terms of their human welfare, as measured by the Human Development Index, and their environmental impact, as measured by their Ecological Footprint. The Ecological Footprint, here expressed as the area of land, in hectares, required to not only generate the resources used per capita of the human population, but also the area of land needed to assimilate the per capita waste production (Rogers, *et al.*, 2008: 70-71). The parameter of the ecological footprint is related to the idea of carrying capacity, and, as indicated in the figure, it is estimated that the Earth has a bio-capacity of 2,1 ha per person. Two important messages are conveyed by Figure 7.3: the first message is that increased human development is accompanied by increased environmental impact, as is evidenced by the fact that the developed countries have much higher ecological footprints than do the developing countries. The second message is that the developed countries are already, at this point in time, consuming more than their fair share of the Earth's resources, given that their respective ecological footprints exceed the earth's bio-capacity by far. The unavoidable conclusion is that

the developed countries will have to reduce their levels of consumption as the developing attempt to raise their levels of human welfare.

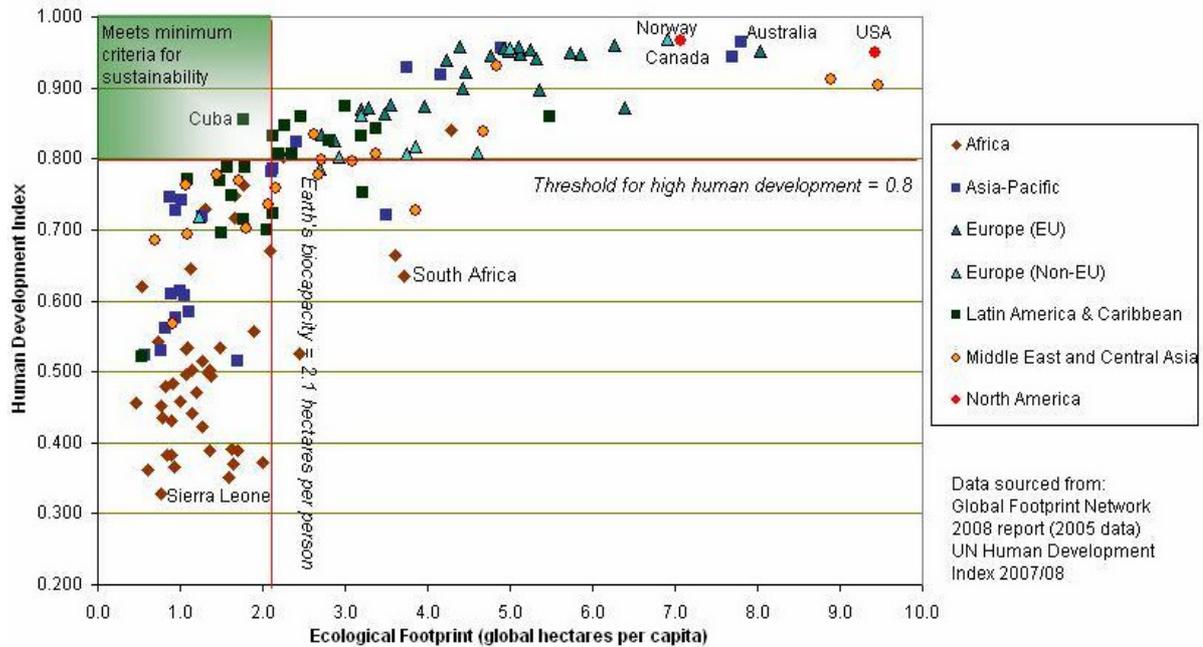


FIGURE 7.3: HUMAN WELFARE AND ECOLOGICAL FOOTPRINTS COMPARED  
(From Gumedé & Ward, 2009: 21)

From the above one may be led towards a notion of sufficiency, which suggests that consumption levels should not exceed that which is sufficient to meet human needs. The principle of *sufficiency* is aimed mainly at unbridled consumerism. It is an economic principle that derives its rationale from the carrying capacity and fairness principles. Sufficiency is difficult to define but in general terms it could be said to be the absence of excess. It seeks to moderate the capitalist aims of profit and wealth maximisation, particularly where these lead to overconsumption and environmental degradation. Because of its subjectivity it involves social decisions. While there might be calls for voluntary restraint, it is likely that regulatory regimes may also have to be established. These could be in the form of penalties incurred by excessive consumption, or wealth taxation; the revenue earned by either of these approaches being used to fund social welfare programmes. Daly also suggests that wealth differentials should be limited – he proposes, for example, that the ratio between the maximum and minimum incomes earned by individuals in an organisation should be ten (1996: 209-211).

While the sufficiency principle as it is formulated here, is broadly stated, its intent of

eliminating unnecessary consumption and controlling the acquisition of excessive wealth, provides a clear direction, even if as a goal it remains somewhat subjective.

***The sufficiency principle***

*While meeting at least the minimum needs of all in society, consumption levels and wealth differentials should be limited by considerations of sustainability and equity.*

Both the *user pays* principle and the *polluter pays* principle are widely acknowledged principles in the sustainable development literature. Dalal-Clayton and Bass express them as follows:

*Polluter pays* – those who generate pollution and waste should bear the costs of avoidance, containment and/or abatement.

*User pays* – the users of goods and services should pay prices based on the full life cycle of costs, including the ‘externalities’ connected with use of non-marketed natural resources and assets and the ultimate disposal of wastes. (2002: 264)

Both of these principles are here, for the sake of brevity, combined into one principle, called the *user pays* principle. It is thus understood that the term ‘user’ is to be interpreted more broadly so as to include, for example, a polluter who uses (or more correctly abuses) the waste assimilation services of nature. This principle is, in effect, again an application of the fairness principle which, in this form, asserts that it is only fair that others cannot be expected to bear the costs of one’s own use of environmental goods and services.

***The user pays principle***

*Whoever receives the benefits from environmental resources or services needs to bear the cost. This requires the internalisation of externalities and the application of life cycle analyses. It also implies, in the case of pollution, the cost of the avoidance and treatment thereof, and compensation for those who suffer the negative consequences of such activities.*

### **7.1.5 Subsidiary principles: Institutional dimension**

The institutional dimension refers in general to three spheres of institutional functioning: the political, the administrative and the business spheres. While it could be considered a part of the social dimension, it is here treated as a separate dimension in order to underline the need for organised society to create an enabling environment in which the application of the other

dimensional principles are promoted and effected.

The first principle put forward in this dimension, the *democracy* principle, can be considered to be a societal version of the fairness principle, as it may be expressed through the institutions of society. It is aimed mainly at governments, requiring them to create the political conditions within a country in which the broad objectives of sustainable development, i.e. the maintenance of environmental integrity, social cohesion and economic vitality, can be realised. It is not difficult to see that there may be many conditions in a society that detract from these objectives. Most prominent might be the form of government of a country. While it is conceivable (but maybe not likely) that in autocratic societies environmental rules may be enforced that promote sustainable development, it is the more obvious negation of individual freedoms in autocratic societies that condemn them as unsustainable. Unrepresentative government denies the principle of participation. Lawless societies cannot be sustainable; poaching, stealing, murdering, etc., are the antithesis of sustainability. And so one could go on. For the sake of reinforcement, the main societal conditions needed for sustainability are listed in the articulation of the democracy principle here below.

***The democracy principle***

*Governments need to create conditions amenable to sustainable development. These include, inter alia:*

- *being representative*
- *being accountable*
- *allowing maximum individual freedom*
- *guaranteeing the other rights as outlined in these principles*
- *guaranteeing public institutional capacity to carry out these principles*
- *guaranteeing the rule of law*
- *combatting crime effectively.*

The second principle to be considered here, the *effective governance* principle, spells out in greater detail those conditions that need to be created by public institutions so that sustainable development is promoted. When in the previous principle it is stated that public institutions need to be capacitated by governments, it means that these public institutions have to be mandated, and given the manpower and finances so that at least those conditions which are listed in the principle here below, can be established.

As can be seen from this list some of the requirements, such as accountability, transparency, administrative competence and fair employment practices are simply sound management rules. The public participation principle obviously needs to be honoured by public institutions, and this may be effected through community engagement and devolved decision-making. The application of sound science can resolve many issues, particularly those in the environmental arena. Population issues, environmental education and the use of appropriate technology are all considered to be integral to sustainable development.

It is obvious that public institutions in the form of government departments will be responsible for the legal and regulatory framework in which sustainable development is to be effected. Instances do occur where government departments seem to be in conflict, as a result of the way in which they interpret their respective mandates; in South Africa the situation between the Departments of Environmental Affairs (DEA), and Mineral Resources (DMR), might be a case in point. Mining operations, on occasion, seem to be sanctioned by the DMR, environmental issues notwithstanding, and with minimal input from the DEA, even while such environmental issues are, one would think, squarely within the jurisdiction of the DEA. Hence the requirement for the co-ordination across the various arms of government, and also for conflict management mechanisms. But society is institutionalised on many levels and in many ways, and government institutions also need to guide, co-operate and network with institutions outside of the public sphere.

The principle as it is worded here below might be criticised for being too wordy and detailed for a principle at this level. In its defence it may be argued, that while effective governance is not a novel concept, yet in many governments, including the South African government, there are clear signs of dysfunctionality; a longer list of the requirements for effective governance might in such circumstances, be more productive in identifying and correcting the problem areas. On the other hand, one may also argue, that in providing a list, an impression might be created that items not on the list are not for consideration. The phrase '*inter alia*' helps here, as does the acknowledgement that the proposed framework, and indeed also the concept of sustainable development, are evolving ideas that are open to amendment as new insights are developed.

***The effective governance principle***

*Public institutions need to provide conditions which enable the implementation of all the sustainable development principles. This requires inter alia:*

- the pursuit of excellence*
- administrative competence and justice*
- transparency around processes, assumptions, uncertainties, etc.*
- accountability (no corruption)*
- a national framework of integrated laws, policies and standards*
- co-ordination between the various levels of government*
- fair employment practices*
- prior and continuing assessment and improvement*
- consideration of alternatives*
- community engagement*
- devolved decision-making*
- conflict management*
- population control and management of urbanisation*
- environmental education*
- application of sound science, with recognition of innovation and traditional knowledge*
- use of low impact and appropriate technology*
- technical adequacy*
- networking with other bodies and institutions.*

In similar vein it can also be argued that institutions outside of government, be these businesses, labour unions, NGOs, or any other grouping, need to conduct their affairs in ways that promote sustainable development. Being diverse in status, power and focus one could expect disparate objectives and actions to emanate from all of these different types of institutions. There is, for example, the danger of businesses simply paying lip service to the so-called triple bottom line while pursuing an overriding profit objective, or that organisations which operate mainly in one sphere of activity (such as, for example, wildlife NGOs whose concerns would revolve chiefly around environmental issues), could as a consequence, in their actions and pronouncements, lack the broader perspective of sustainable development, or that in smaller entities, due to economic or other pressures, ‘short-cuts’ are taken. But when taking such requirements as transparency, accountability, community engagement and others listed under the effective governance principle, into the *corporate responsibility* principle, introduced here below, the obligation on all non-government institutions to do their share in the promoting of sustainable development is unequivocal.

***The corporate responsibility principle***

*Businesses and organisations are required to conduct their operations so as to promote the objectives of sustainable development. This requires adherence to, as appropriate, the conditions as listed under the effective governance principle, and a pro-active stance on all matters dealing with sustainability.*

It is the nature of many environmental problems that they are not contained by national borders. Similarly there are natural resources that have to be shared by more than one country. Some international companies have become so large that their annual budgets exceed the gross domestic products of smaller developing countries and as a result they can exert undue influence on political decisions and national policies of such countries. Also the economic and industrial power of developed countries can put developing countries at a disadvantage, whether this be in cases of competition for limited resources or bearing the cost of excessive waste production. In the social dimension such skewed power relations could lead to the weaker player having to compromise on principles. South Africa, it appears, was reluctant to antagonise a main and powerful trading partner, China, by allowing the Dalai Lama, who has criticised the Chinese human rights record, to visit our shores (Cameron-Smith, 2012). Another example, already previously mentioned, is the case of global warming where it is said that developing countries may suffer negative consequences far in excess of their contribution to the problem. In the face of these global issues and problems, the *global principle*, as formulated here below, is aimed at fostering international co-operation, governance and responsibility towards the ideal of sustainable development.

***The global principle***

*The global nature of many environmental issues requires of governments, multi-national companies and international organisations to promote sustainable development through inter alia:*

- international co-operation based on the recognition of national sovereignty as well as global responsibilities*
- adherence to international law and treaties*
- liaison between all role players*
- global commons obligations*
- consideration and limitation of trans-boundary harm*
- recognition of North vs South disparities and obligations*
- international peace.*

### 7.1.6 The PSDF principles

All of these proposed principles of sustainable development are collected together in Appendix C16 as a preliminary step before their inclusion into the proposed sustainable development framework (PSDF). They will be referred to, in short, as the PSDF principles. In order to facilitate comparison these PSDF principles are also included in Appendix C14, which is a tabular summary of all the suites of principles reviewed. A scrutiny of this table in Appendix C14 will reveal that the PSDF principles cover virtually all of the topics gleaned from the reviewed suites. There are some exceptions, and two of these occur in lines 44 and 45,<sup>260</sup> dealing respectively with *right of refusal* (of workers to do work harmful to human health) and *tolerance*. Both of these topics occur in only one suite of principles, a fact which supports, to a degree, their exclusion (as such) from the PSDF suite. They may however be subsumed under other principles. The right of refusal could, for example, simply be considered as being included under the human rights provision in the human dignity principle (#3.2 in Appendix C16), and tolerance is certainly implied by many of the principles in the social dimension of the PSDF suite.

In line 53 the topic of an *open economic system* is mentioned. It is not included in the PSDF set of principles on two grounds. To the extent that this topic refers to the need for international markets to be opened up (through, for example, the removal of subsidies) so as to allow developing nations to be more competitive, it is covered in the PSDF by the global principle (#5.4). On the other hand, to the extent that this topic refers to free market objectives, there are many who would question the inclusion of such objectives in a sustainability programme. While the PSDF does not reject the notion of a free market out of hand (there is a guarded acceptance of the advantages of a free market in the efficiency principle (#4.1)), it does, at the same time, not elevate the free market ideal to a principle in its own right. Similar thinking is employed around the *preference for a system of social governance*. In only one of the reviewed suites of principles is it explicitly stated that no preference should be given (line 60), and by simply not making any mention of a preference in this regard the PSDF is silently endorsing this position of not favouring any particular form of governance. The topic of international

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<sup>260</sup> All the line numbers quoted in this sub-section are with reference to Appendix C14.

competitiveness in line 97 (only mentioned in one of the reviewed suites) is also too close to a free market endorsement to warrant inclusion in the PSDF suite. In line 99 the *UN agency* is brought up, not unsurprisingly, in the principles emanating from two UN sponsored international conferences. In the PSDF it is felt the global principle (#5.4) adequately covers this topic even without specific reference to the UN. Given then that the PSDF principles cover, by and large, all the principles from the thirteen suites reviewed, it may be concluded that the PSDF suite is sufficiently broad and comprehensive to serve as a model suite of sustainable development principles.

In order to further validate the PSDF principles they will be compared to a set of sustainable development principles prepared by Gagnon, *et al.* (2009). As Gagnon and all his co-authors are faculty members of the University of Sherbrooke in Quebec, Canada, their suite of principles will here be denoted as the *Sherbrooke principles*, and they are reproduced under that appellation in Appendix C15. The reasons for using the Sherbrooke principles in this validation exercise are twofold. Firstly, these principles were derived in a manner similar to that used in the derivation of the PSDF principles, namely, by reviewing and comparing a number of suites of sustainable development principles drawn from sources across the world. However the suites of principles used in the Sherbrooke exercise, and those used in this study are, by and large, authored by different bodies. Thus one may assume that a strong correlation between the Sherbrooke principles and the PSDF principles would enhance the validity of both sets of principles. The second reason for using the Sherbrooke principles is that they are actually presented in the form of two corresponding versions, one version with a general orientation, while the other is oriented more towards engineering practice. This latter orientation ties in with a theme of this study, and thus, to the degree that the Sherbrooke and the PSDF principles correspond, the validity of the PSDF principles in the engineering arena is enhanced.<sup>261</sup> A summary of the comparison between the Sherbrooke principles and the PSDF principles appears in Appendix C17.

The first obvious difference between these two sets of principles, is the way in which they are

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<sup>261</sup> In the PSDF it is not considered necessary to distinguish between 'general' principles of sustainable development and 'engineering' principles of sustainable development, the feeling being that the 'engineering' principles are simply a more narrowly focussed version of the 'general' principles – a conclusion borne out by a scrutiny of the two versions of the Sherbrooke principles.

categorised. Although both sets of principles employ a categorisation based on the dimensions of sustainable development, the Sherbrooke principles do not use the additional category of foundational principles, and furthermore they also adhere to the traditional three-fold dimensional categorisation of sustainable development, thus excluding the institutional dimension that has been employed here. It has already been mentioned that the categorising of the principles into the various dimensions is somewhat arbitrary, in that many of them obviously have implications beyond the dimension into which they have been categorised, and this is underlined by the use of multi-dimensional categories in the Sherbrooke principles. Hence the view, previously expressed, that the dimensional categories are mainly categories of convenience rather than of principle, still holds, and the fact that the Sherbrooke principles are based on a three-dimensional conceptualisation of sustainable development, as opposed to the four-dimensional approach of the PSDF principles is by no means significant.<sup>262</sup>

While the Sherbrooke suite of principles does not have a category of foundational principles, many of the foundational principles listed in the PSDF suite, do surface implicitly in the Sherbrooke suite in one or more of its other categories. Notwithstanding this mitigative observation, the lack of an explicit formulation of foundational principles in the Sherbrooke suite is here deemed to be a deficiency. Surely it is not only reasonable but also useful to identify and group together those principles which are fundamental and of over-arching nature. To this may be added the fact that the PSDF principles are part of a framework that includes a vision, basic ethical values, goals, etc. all arranged in a hierarchy of authority and significance. While the objectives in formulating the Sherbrooke principles may have been different from those used in this study to formulate its framework of sustainable development, it is nevertheless felt that the latter presents a far more catholic and comprehensive picture of the concept of sustainable development.

It may also be mentioned that the authors of the Sherbrooke principles make a point of balancing the number of principles in each of the dimensions to reflect “the equal importance given to each dimension of sustainability” (Gagnon, *et al.*, 2009: 1461). However, given, on

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<sup>262</sup> Note that this flexible interpretation of the categories into which the principles of sustainable development are divided, applies only to the dimensional categories; the category of foundational principles of the PSDF, is by design the home of principles which are by nature more fundamental and overarching, and these principles can only fit into this foundational category.

the one hand, that in their own analysis of fourteen other sets of principles Gagnon and his co-authors found an imbalance in the total number of principles resorting in each of the dimensions, and on the other hand, that the dimensional categories are in any case somewhat porous, meaning that many principles have relevance across the dimensions, it is here concluded that the dimensional symmetry imposed on the Sherbrooke suite of principles is a rather artificial contrivance, and not in any fundamental sense, necessary.

There are some other differences between the principles of the two sets under discussion here that may need some brief comment. The Sherbrooke principle 3 that calls for the publication of information on the state of the environment, is not included as such in the PSDF principles, but it could easily be considered as being an integral part of both the transparency and environmental education requirements under the PSDF's effective governance principle (#5.2). In the Sherbrooke economic dimension the formulation of principle 10 requires a 'positive, genuine, long term investment considering all types of capital'. This principle is not explicitly matched in the PSDF principles, but it is believed that its objectives (also as they emerge from the 'engineering' version of principle 10) are adequately covered in the 'long-term thinking' of the holism principle (#1.2), the 'economic vitality' objective of the economic dimension, and the general thrust of the economic efficiency principle (#4.1).

While all the Sherbrooke principles find some correspondence in the PSDF principles, it is evident that there are a number of PSDF principles which are not readily matched by any of the Sherbrooke principles. Hence one may conclude that the PSDF set of principles might at worst be somewhat overelaborate, but then, on the other hand, surely not deficient in any significant sense. It is firstly, the omission of the holistic principle, in explicit form, from the Sherbrooke principles which, given the principle's foundational status, may be a matter of concern. Other principles which do not appear in the Sherbrooke suite include the minimum impact (#2.4), the anti-cruelty (#2.5), the sufficiency (#4.2), the democracy (#5.1), the global (#5.4), and the practicality (#5.5) principles. Perhaps, if one accepts that the *full* intention of an author (or authors) could, as a result of the imprecision of the phraseology used, not always be crystal clear to a reader, one should not make too much of these omissions from the Sherbrooke suite. On the other hand, the fact that these principles are omitted from the Sherbrooke suite, may suggest that they are not really necessary, and so some brief comments in this regard might be

in order. As was noted at the time of its formulation in the PSDF suite, the anti-cruelty principle was not widely employed in the sets of principles reviewed, and hence some effort was made at that time to justify its inclusion (see §7.1.2). In short, it is regarded as a minimum requirement in expressing the biocentric (the respect for life) principle in more practical terms. The inclusion of the minimum impact and sufficiency principles in the PSDF set of principles is considered adequately justified in the light of the many instances where, in this study, attention has been drawn to the negative impact of modern consumerist societies on the environment. (Perhaps the fact that the Sherbrooke authors are from a developed country, where high levels of consumerism prevail (refer to Figure 7.3), might render them less aware of, or sensitive to the consumerist dangers.) In the case of the democracy and the global principles, their omission from the Sherbrooke suite is perhaps understandable if it is taken into account that in the Sherbrooke principles the institutional dimension, under which these principles resort, is not employed as a separate category. The practicality principle is a later inclusion in the PSDF principles (see §7.2.3) and thus while its rationale may at this point still be somewhat obscure, it can be stated that it is a principle that would typically appeal to engineers, and hence one might wonder at its omission from the Sherbrooke suite, particularly from the engineering version thereof. For the moment, however, the justification for this principle will simply be left in abeyance, until it is picked up again in §7.2.3. With these few comments it is concluded that the PSDF suite of principles is not inferior to the Sherbrooke principles, and that they might even be more effective in giving sustainable development not only adequate, but comprehensive coverage.

In Appendix C17 it is not only the Sherbrooke principles that are being compared to the PSDF principles but also the principles contained in the National Environmental Management Act. (See Appendix C10 for a full reproduction of the NEMA principles.) Here again, as was the case with the Sherbrooke comparison, it can be seen that, if anything, the PSDF principles exceed the NEMA requirements (coincidentally at almost the same places as was the case with the Sherbrooke principles). The reason for the inclusion of the NEMA principles in the Appendix C17 comparison is to confirm that the PSDF principles, assuming that they are to find application in South Africa, conform to the law of the land, at least as far as NEMA is concerned. However it might also be argued that a comparison between the PSDF principles and the NEMA principles is somewhat spurious as the former were derived, *inter alia*, from the

latter. But it is felt here that the PSDF/NEMA comparison in Appendix C17 is a handy, principle-by-principle, South African justification of the PSDF suite.

Having thus made a comparison between the Sherbrooke, NEMA and the PSDF sets of principles, it is here concluded that the PSDF suite is, if anything, the more comprehensive of the three sets. With its category of foundational principles in addition to its dimensional categories, which include the institutional dimension, the PSDF suite of principles is considered not only adequately comprehensive, but also well-balanced and structured.

## 7.2 THE MEASUREMENT OF SUSTAINABLE DEVELOPMENT

In this study a *sustainable society* has been accepted as the vision of the sustainable development framework that is being constructed here. (See §5.3.2.) The obvious premise must then be that society at *present* is not functioning sustainably, and that the vision thus represents some desired future state. If this is the situation, then *sustainable development* may be taken to be the means of progressing towards this future state. It now follows that if this progress towards a future state is to be meaningful, it will need some form of assessment. Hence the state of sustainability in society needs to be *measurable*, so as to uncover whatever discrepancies there may be between the future vision of a sustainable society and its present state. The objective is also to confirm, with repeated measurements over time, the progress, or lack thereof, towards the state of a truly sustainable society. If there is a discrepancy or a lack in progress, then hopefully actions can be taken to rectify the situation. Assuming for illustrative purposes that the discrepancies in sustainability are in the environmental dimension, then they can possibly be addressed by reducing the material and energy demands (inflows) of society, and/or by reducing the waste production (outflows). This model of progress towards sustainability is presented in Figure 7.4. Continuing the illustration of material and energy inflows and the waste outflows, it can be stated that they are *indicators* of sustainable development. Usually a number of indicators have to be considered together in order to get an assessment of the overall level of sustainability.

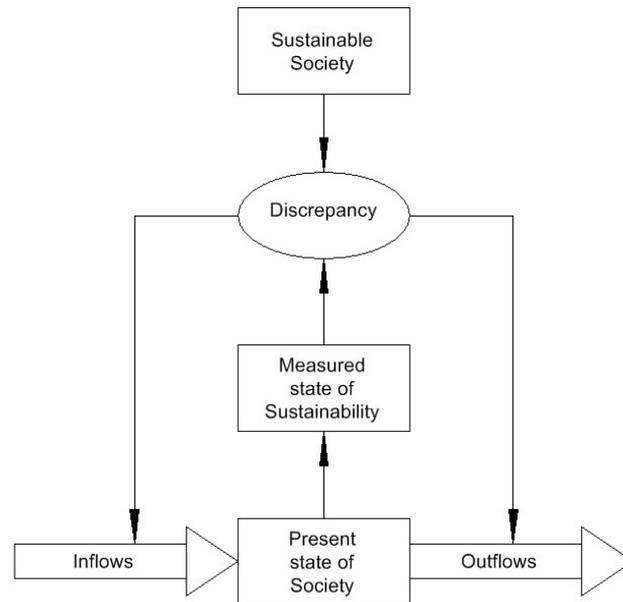


FIGURE 7.4: PROGRESSING TOWARDS A SUSTAINABLE SOCIETY  
(After Meadows, 1998: 3)

With the above as introduction it is now appropriate that the remainder of this sub-section be devoted to the consideration of the ways in which sustainable development can be measured.<sup>263</sup> The objective is to give a brief overview of the general approaches to mensuration in sustainable development, and in so doing to possibly shed further light on the nature of sustainable development itself. It also then stands to reason that if sustainability mensuration parameters can be included in the proposed sustainable development framework the value of the framework itself will be enhanced.

### 7.2.1 Indicators as used in the measurement of sustainable development

Given the wide ranging interpretations applied to sustainable development (and also, on occasions the concept of the environment), it seems highly unlikely that a single measure of assessment could ever suffice. Despite attempts to develop such a single measure, the more common approach has been to rely on a number of measures or indicators, which collectively would, it was hoped, reflect the state of sustainability (of the environment, broadly speaking).

<sup>263</sup> It is accepted that some commentators might feel that all this talk about measurement is too mechanical; sustainable development is after all also a qualitative thing. The reality is that the seriousness of sustainability problems, be they environmental like global warming, or social like poverty, are expressed in quantifiable terms, and hence the approaches towards solving them will also need to be quantifiable.

Indicators are widely used in everyday life for all kinds of assessment; for example, the daily humidity can be used as an indicator of the climate of a region, or the national level of employment can be used as an indicator of the general welfare of a country. Obviously some indicators are better than others at assessing that of which they are supposed to be an indicator. More generally, a group of indicators, used together, provide a better assessment of the situation in question. As sustainable development is an evolving concept, one would expect the range and spectrum of indicators used in its assessment also to be evolving. Inevitably there is also some subjectivity in the selection and use of indicators. According to Meadows:

Indicators can be tools of change, learning, and propaganda. Their presence, absence, or prominence affect behavior. ... We try to measure what we value. We come to value what we measure. The feedback process is common, inevitable, useful and full of pitfalls. (1998: 2)

Thus it seems that sustainable development is, to some degree, defined by its measurement, or alternatively phrased, measurement aids a fuller understanding of sustainable development. There is also the danger that our perception of sustainable development may be limited to that which we can measure. On the other hand, measurement can also serve to prioritise sustainable development actions.

So firstly, indicators will help to focus sustainable development and form the basis on which management decisions can be made. But in addition to this obvious purpose, Parris and Kates (2003: 569-570) identify three further purposes which indicators may serve. They may, for example, be the basis on which certain interest groups could lobby for their particular interpretation of sustainable development. In other cases indicators, particularly those in the social dimension, could facilitate participation and consensus building. And in the final instance indicators could also be the basis of further research and analysis into sustainable development. These uses to which sustainability indicators could be put underline the dynamics they bring to the understanding of sustainable development.

While the wide scope of sustainable development, its alleged vagueness and imprecision, all contribute to a whole array of instruments that purport to measure sustainable development (or some aspect of it), a need has unfolded for an assessment of the instruments of measurement themselves. Bell and Morse (2008: 14-20) structure the debate around sustainability measurement by posing three questions:

- what is to be measured?
- over what time span is it to be measured?
- what is all to be included in the measurement?

Turning first to the second question posed here above, it is in essence asking what an appropriate time scale would be to use in the measurement of progress towards sustainability. Bell and Morse show that the outcome of a measurement exercise is dependent not only on the length of the time scale used, but also on its starting point, and, furthermore, that by varying these parameters within the same data set, one could arrive at differing, and even contradictory conclusions. The third question here above is, in one a sense, a question of spatial scale, or more generally it is a question of scope. If the holistic nature of sustainable development is to be honoured, one would expect that everything that could have a possible bearing on the sustainability needs to be included in the measurement exercise. Clearly the complexity of assessing many variables simultaneously must bring about some curtailment in what is to be included in the measurement. In practical situations the very real constraints of time and finance also prescribe some curtailment. And then one must ask how much of such curtailment can be accommodated before the outcome of the assessment becomes too compromised. Without doubt insight and experience are required to guide decisions around these issues.

And if the questions of the appropriate time and the spatial scales are difficult and have no clear answers, then it is the first question, the issue of *what* is to be measured, that is really vexing. In general terms it is system quality that is to be measured, but then what system? The earlier conceptions of sustainable development interpreted system quality in terms of ecological parameters, such as water quality and level of air pollution. Of course there are many such ecological parameters, and while one might debate their individual contributions to sustainability, at least they are mostly based on readily measurable physical conditions. However the later, fuller conceptualisations of sustainable development incorporated the notion of the *human quality of life*, and this is not only a somewhat nebulous, but also a highly subjective concept, and certainly not easily measurable as a whole.

According to Parris and Kates (2003: 560) the question of what is to be measured, depends on how one defines sustainable development, and to that end they pose two more specific

questions:

- what is to be sustained?
- what is to be developed?

In an attempt to answer these questions they then propose the breakdown shown in Table 7.1.

TABLE 7.1: TAXONOMY OF SUSTAINABLE DEVELOPMENT GOALS  
(Parris & Kates: 2003: 561)

<b>WHAT IS TO BE SUSTAINED</b>	<b>WHAT IS TO BE DEVELOPED</b>
<p><i>Nature</i></p> <p>Earth Biodiversity Ecosystems</p>	<p><i>People</i></p> <p>Child survival Life expectancy Education Equity Equal opportunity</p>
<p><i>Life support</i></p> <p>Ecosystem services Resources Environment</p>	<p><i>Economy</i></p> <p>Wealth Productive sectors Consumption</p>
<p><i>Community</i></p> <p>Cultures Groups Places</p>	<p><i>Society</i></p> <p>Institutions Social capital States Regions</p>

Table 7.1. does bring some clarity, but Meadows points out that the consideration of the above two questions, while important, will be inadequate if done in isolation. It is their *combined* consideration that is required. In her words, “Development and sustainability are old problems; now they come together on a global scale and in an urgent time frame.” (1998:11)

From Table 7.1 one may deduce what kinds of indicators need to be employed, but it also becomes increasingly evident that there can be a great number of indicators, each dealing with some subsidiary aspect of sustainable development. In some schemes there could be of the order of 40 or 50 indicators, and in others well over a hundred (Parris & Kates, 2000: 562-566). At once one wonders how, out of such an abundance of indicators, one could be confident of making an overall assessment of the progress in sustainable development. Some confidence

might be gained by promoting interventions that aim at meeting certain goals and targets,<sup>264</sup> but then again the question still remains; to what extent do the goals and targets in themselves represent sustainability? For the sake of clarity the definitions provided by Parris and Kates are repeated here:

*[G]oals* are broad, but specific qualitative statements about objectives chosen from the major categories of what to sustain and what to develop. ... *Indicators* are quantitative measures selected to assess progress toward or away from a stated goal. ... *Targets* use indicators to make goals specific with endpoints and timetables. (2003: 572-573)

Indicators, furthermore, have to meet certain general requirements, such as salience, credibility, and legitimacy. In the words of Parris and Kates again:

*Salience* refers to relevance of the measurement system to decision makers, *credibility* refers to the scientific and technical adequacy of the measurement system, and *legitimacy* refers to the perception that the production of the measurement system is respectful of stakeholders' divergent values and beliefs, unbiased, and fair in its treatment of opposing views and interests. (2003: 573)

With so many sustainability indicators out there, and the questions about the salience, credibility and legitimacy of each, it is understandable that the yearning for a single measure of sustainable development still persists. To this end some theorists have worked on the aggregation of a number of indicators into a single overall indicator, or index. But while such a single index may score in terms of salience, its credibility will be under question, if for no other reason than for the fact that it is a "synthetic" indicator, as opposed to the base indicators from which it is sourced, and which are derived from real observations. Quite often the construction of such aggregative indices can be rather technical and therefore obscure to stakeholders, with the result that they are labelled as "black box" indicators with low legitimacy. Thus it is not easy for a proposed aggregative index to be broadly accepted as a measure of sustainable development. Probably one of the most well-known indices in common currency is that of the gross domestic product of a country (GDP), which used to assess the level of development of the country in question. But with respect to sustainable development its theoretical credibility has been questioned by a number of theorists. (See Daly, 1996: 40-42.) Its loss of legitimacy in environmental circles has led to the development of alternative indices. Boulanger (2008: 48) refers to no less than six such indices (mostly attempting to

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<sup>264</sup> See, for example the Millennium Development Goals (Rogers, *et al.*, 2008: 160-161).

address the socio-economic dimensions of sustainable development):

- the Human Development Index (HDI),
- the Index of Sustainable Economic Welfare (ISEW),
- the Genuine Progress Indicator (GPI),
- the Measure of Domestic Progress (MDP),
- the Index of Economic Well-being (IEW), and
- the Human Well-being Index.

However, in Boulanger’s assessment, it is only the HDI that has “gained sufficient legitimacy to become institutionalised” (2008: 47). The HDI was developed by Nobel Laureate Amartya Sen and is based on measures of the longevity, education and earnings in a population. Every year the UN publishes the HDI ranking of all countries (Rogers, *et al.*, 2008: 121). (See also Figure 7.3.)

Before discussing the problems around indices further, it might be useful to first run through the steps involved in constructing an index. These are graphically illustrated in Figure 7.5.

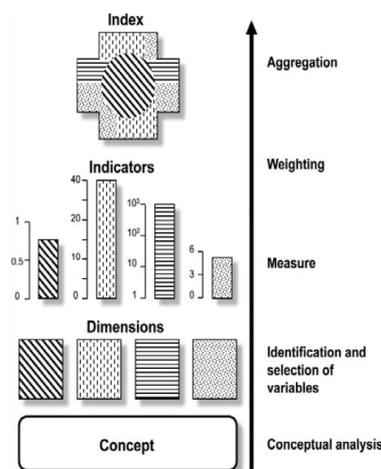


FIGURE 7.5: THE CONSTRUCTION OF INDICES  
(Boulanger, 2008 : 47)

The generic process illustrated in Figure 7.5 can be explained by using ecosystem health as an illustrative example. The *concept* to be analysed will be biodiversity, high levels of which represent healthy ecosystems. Its *dimensions* are the abundance of species classes, and the abundance of individuals within in species class. When these dimensions are measured in a sample and expressed numerically they become *indicators*. In an attempt to get overall assessment of biodiversity, these indicators, the number of species in the sample, and the

number of individuals of each species present in the sample, could be aggregated in to a single index. In the case of biodiversity such an aggregated index is the so-called Shannon-Weiner Index (Bell & Morse, 2008: 27). In calculating the Shannon-Weiner Index the weighting allocated to the various indicators is either one or zero; one for those species included in the calculation (often referred to as the indicator species), and zero for those excluded. The exclusion of a species could be for any of a number of reasons, such as the lack of data in respect of such species, the abundance of the species, or the perceived unimportance of the species, etc.

A choice with which analysts are faced is that of whether to present their results at the level of indicators or at the level of indices. In the first case the results will be in the form of tables or diagrams, the so-called scoreboard approach (Boulanger, 2008; 46), and in the second case in the form of a single parameter. It is worth noting that the initial steps are the same for both approaches, but the difference lies in the last step of aggregation. The advantage of an index is the ease with which a result can be assessed, and with which comparisons can be made. For example, if the issue is sustainability, then one could conclude that alternative A is sustainable and alternative B is not, or otherwise alternative C is more sustainable than alternative D, etc. The disadvantages of indices are that in the process of aggregation some information is lost, and questions of scientific credibility arise. Also, in many cases the aggregation calculations are technical and complex and thus less intelligible to decision-makers and stakeholders, hence reducing their legitimacy again.

The aggregation process involves the steps of standardisation and weighting. For complex concepts such as sustainable development, it is not likely that the units of measurement for the various indicators will be the same. Hence in order for them to be amalgamated into a single measure requires, firstly, that they be transformed to make them compatible; this is what is meant by standardisation. Secondly they have to be weighted according to their relative importance. Because of the subjectivity involved in this step, the issues of bias and political pressures arise. For some the process of aggregation into a single index attempts to do the impossible; Baneth (as quoted by Boulanger) says, "It [is] a vain, pretentious and slightly ridiculous endeavour to try to sum up [sustainable] development in all its complexity and multiple dimensions with a single figure." (Boulanger, 2008: 47)

On the other hand it would be a mistake to assume that the scoreboard approach, for a multi-faceted concept such as sustainable development, is devoid of subjective elements. For example, if the scoreboard is to be used to make decisions between alternatives on the basis of which are more or less sustainable, the decision-makers will, wittingly or unwittingly, be employing their own biases or political preferences. These, possibly hidden, subjective elements can be overcome in the aggregation process if the weighting is transparent and democratic. Thus Boulanger asserts that,

the requirements of sustainable development in fact imply an evaluation of these arbitrary choices, in the context of democratic debate and in the light of ethical and scientific criteria. And it is precisely because it forces us to put on the political agenda an evaluation of these choices and weights, which are the components of life in society, that constructing synthetic indices for sustainable development is necessary. (2008: 51)

Meadows on the other hand, while not decrying the value of a single index, is less sanguine. She argues that,

we will probably never settle on a single global index of sustainable development – too many different people work on different problems and need different kinds of information. (1998: 7)

And she continues,

We need many indicators because we have many worldviews ... [and] worldviews define what is important, what questions can be asked, what goals are possible, *what can and should be measured*. (1998: 8)

Not only is Meadows pessimistic about a single index, she also sees an advantage in using many indicators, in that they,

can be a tool for expanding, correcting and integrating worldviews ... [thus] help[ing] to narrow the differences between worldviews.<sup>265</sup> (Meadows, 1998: 8, 7)

Turning to another aspect of indicators, Meadows also warns against the lure of quantitative measures – their ease of verification and lack of ambiguity should not negate the value of qualitative indicators. In her opinion:

If we guide our decisions only by quantitative indicators and not qualitative ones, we will produce a world of quantity without quality. Many of our social and personal problems arise from the fact that we are well on our way to doing exactly that. (1998: 10)

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<sup>265</sup> Again the dynamic role of indicators comes through.

Having tried to create an initial understanding of sustainability indicators by identifying their areas of application (Table 7.1), their characteristics and the technical process of indicator/index design (Figure 7.5), it may be opportune to investigate their nature more fundamentally. It has been mentioned that a single index can be created from a number of base indicators, but also that the legitimacy of such indices are suspect for various reasons, not the least of which is located in the complexity and ambiguity of the concept of sustainable development itself. Hence one may ask if it would not be more effective to use a hierarchy of indicators ranging from the more simple to the more complex, where the higher level indicators are based on the lower level indicators. Yet even such an attempt at greater transparency will at each level of aggregation again be faced with questions of not only scientific validity, but also democratic justification. This implies that indicator design and selection cannot simply be in the domain of the experts but rather that representative bodies are needed to lend legitimacy and credibility to indicators. In short the process of indicator design and selection is a contextual and collaborative process. Hence one may conclude that the indicators selected in one given situation may differ from those selected in another. If sustainability is paradigmatic of a complex system, there is no reason to expect that the design, selection and use of sustainability indicators themselves should escape this systemic complexity.

From this system perspective it might be useful to identify some typical indicators that are aimed at monitoring or controlling a system. A simplified system is depicted in Figure 7.6. and it is taken to be sustainable if the stock, inflows and outflows are in balance. The stock referred to in this figure could be natural capital in the form of natural resources or waste assimilation capacity, or it could also refer to human, social or economic resources. A disproportion between the inflows and the outflows can threaten the stability of the system, and this may be exacerbated through exponential rates of change in the inflows and outflows, and when there are non-linearities and thresholds in the system response. The system response is a function of its resilience, its in-built control mechanisms (negative feedback) and its evolutionary potential. These systemic interactions and corresponding indicators are summarised in Table 7.2.

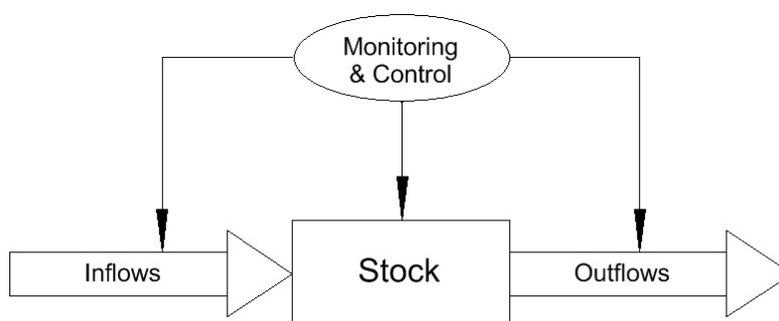


FIGURE 7.6: GENERIC SYSTEM

TABLE 7.2: SYSTEMS AND INDICATORS

(Based on Meadows, 1998: 28-39)

System characteristic	Concern	Typical indicator
Stocks: the state of the system	The stock response to change	Turnover time: stock size ÷ flow rate
Flows: inputs and outputs per time unit	Balance of flows affecting a stock	Emission rate/absorption rate (>1, unsustainable)
Exponential growth (Positive feedback)	Humans tend to think in terms of linear growth rates	Doubling or halving time
Non-linearities (Thresholds)	Sudden, sometimes irreversible system changes	Time to point of turning or irreversibility
Evolutionary potential	Long term viability	In terms of technology: number of engineers/capita
Control (negative feedback)	Alacrity of response to development of problem	Problem change rate/response rate (<1, critical)
Resilience	Weak or missing feedback	Insurance in the economic sphere

It should be apparent that the typical indicators presented in Table 7.2 extend beyond the natural environment, which emphasises that systems theory can also be applied to natural as well as socio-economic systems, and that Table 7.2 can indeed be considered generic over the full spectrum of sustainable development dimensions. It should also be evident by now that complexities of natural, social and economic systems suggest that a large number of indicators may be necessary – indeed, as has been indicated here above, in some assessment systems the

count of indicators is in the order of hundreds. It has also been stated that it would be reasonable to expect that the choice of indicators for a given system in one situation could vary in another situation, depending *inter alia* on data availability and objectives of the assessment. In this study it would thus not serve much purpose to search for a list of basic or master indicators, as there are so many indicators available and their selection and use could vary from situation to situation. The best that can be done, for the moment, is to refer, on the one hand, to *generic indicator themes* as is suggested in Table 7.4, and, on the other hand, to rather identify a set of *assessment principles* that could govern the selection, design and use of indicators.

Attention will first be focussed on the issue of assessment principles.

### **7.2.2 The Ballagio principles**

A well-known set of principles for the assessment of sustainable development, derived by an eminent international group of assessment practitioners and labelled the *Bellagio Principles for Assessment* (Hardi & Zdan, 1997), will form the basis of the discussion in this sub-section. They have already been referred to previously (see §7.1.1), and they are reproduced in Appendix E.

This set of principles extends beyond simply the issues of indicators and assessment to cover what might be termed sustainable development in practice. As such these principles correlate very closely with the principles of sustainable development itself. According to Hardi and Zdan these

principles are a pragmatic expression of core values. They serve as practical guidelines for the whole of the assessment process from system design and identification of indicators, through field measurement and compilation, to interpretation and communication of the result. (1997: 8)

A total of ten principles make up the set, and because the principles are considered to be interrelated, they need to be applied as a whole.

#### **1. Guiding vision and goals**

The first principle emphasises the necessity of having a clear vision, in terms of which goals

can be spelt out. This study, in setting a sustainable society up as the vision of its proposed sustainable development framework, has already met this requirement at a foundational level. In addition to the vision there are also the core values of reverence for life, beneficence, and fairness. Thus any indicator selected or designed in terms of the proposed sustainability framework, must in an ultimate sense, aim towards a sustainable society on the basis of the said values.

The next four principles represent a flow from theory to practice. They “deal with the content of any assessment and the need to merge a sense of the overall system with a practical focus on current priority issues” (Hardi & Zdan, 1997: 1).

## 2. Holistic perspective

The second of the Bellagio principles calls for a holistic perspective, which requires, *inter alia*, an integration of the “social, ecological and economic sub-systems”, and both the “positive and negative consequences of human activity” (Hardi & Zdan, 1997: 2). The principle of holism has already been accepted as a foundation principle of the proposed sustainable development framework (see §7.1.1), and so again the value and importance of the broader picture is reinforced. The interrelationships between the subsystems are important, but because our understanding of these relationships is still evolving, Hardi and Zdan (as did Meadows earlier) stress “the need to assume a learning and reflective stance. A given interpretation of an indicator set or a particular system assessment should be considered as part of a learning exercise, never an end in itself.” (1997: 12) This is a typical pragmatic approach along the lines of Weston’s “enabling environmental practice” (1995: 467).

## 3. Essential elements

This principle again raises the three-dimensional model of sustainable development, but now with a more specific focus on the critical issues in each of these dimensions. In the social sphere the issues are equity, both intra- and inter-generational, over-consumption, poverty and human rights. In the ecological sphere, the life support function of the environment is stressed, and in the economic sphere the standard focus on growth must defer to development, and this requires *inter alia* the equal consideration of those non-market activities that contribute to sustainability.

#### 4. Adequate scope

Temporal and spatial scales are addressed in this principle. The need for long term thinking (incorporating ecological time scales and future generations) must complement the usual short term decision-making. The consideration of historic conditions will aid in conceptualising the possibilities for the future. Environmental (and even social) problems regularly manifest themselves beyond local and national boundaries, and while clearly it is not practical to “compile everything about everything”, the reasons of simplicity and cost must not be allowed to limit the scope of sustainability assessments unduly.

#### 5. Practical focus

The sentiment of the preceding sentence is carried forward into principle 5. In order to avoid expensive, time-consuming and amorphous sustainability assessments this principle calls for:

- an explicit set of categories or an organizing framework that links vision and goals to indicators and assessment criteria
- a limited number of key issues for analysis
- a limited number of indicators or indicator combinations to provide a clear signal of progress
- standardizing measurement wherever possible to permit comparisons
- comparing indicator values to targets, reference values, ranges, thresholds, or directions of trends, as appropriate. (Hardi & Zdan, 1997: 16)

The next three principles address a function of sustainability assessment that is not always recognised or explicitly acknowledged. Sustainability indicators are essentially a means of communication – the communication that should take place between the sustainability assessment role players, the practitioner, the decision-maker, the interested and affected parties and the public at large. The next three principles stress the need to communicate fully, effectively and widely.

#### 6. Openness

Some sustainability indicators can be highly technical, and may appear completely objective. Attempts should be made to explain to all interested parties the structure of an indicator, and on which data it is based. Importantly, hidden assumptions, interpretations and uncertainties should be made explicit. In other words this principle is none other than a principle of transparency.

#### 7. Effective communication

This principle reiterates what has been said by way of introduction here above. In selecting or designing indicators the needs and capabilities of the audience and the decision-makers need to be taken into account.

#### 8. Broad participation

Not only should the messages of the sustainability indicators be communicated, but relevant role players should also, to the extent that it is feasible, be involved in the selection and design of indicators. This ensures their legitimacy and their acceptance by all.

The last two principles address the need for a continuing assessment capacity.

#### 9. Ongoing assessment

This principle addresses the need for continuity. Trends need to be established, systemic changes need to be noted, learning needs to take place, and where necessary the framework of assessment (or of sustainable development, as it may turn out) needs to be adapted and the indicators improved or discarded.

#### 10. Institutional capacity

Theoretical frameworks of assessment, though necessary, come to naught if in practice they cannot be operationalised due to the lack of capacity to do so. This means not only the capacity to monitor activities in terms of their contribution towards sustainability, but also the capacity to follow up on assessments by initiating corrective actions. Government departments, charged with the duty of sustainable development, are the obvious institutions that need to be capacitated in this regard, but in the broader society, it is also NGOs, practitioner bodies and public interest groups that need to be capacitated, each according to their own needs and roles. Importantly, it should be noted that capacitation requires, in simple terms, that expertise and resources be made available. While all have to play their role in building capacity, the final responsibility rests with the government of the day.

In reviewing the Bellagio principles it becomes evident that there is a strong correlation between them and the principles included in the sustainable development framework proposed

in this study (the PSDF principles – see Appendix C16). While these two sets of principles have different stated areas of focus, the Bellagio principles being focussed on the *assessment* of sustainable development, and the PSDF principles focussing on sustainable development itself, it appears that most of the Bellagio principles are also contained in the PSDF, implicitly if not explicitly. And importantly, it also emerges that there are no points of contradiction. That such a close correlation is to be expected follows logically from the inference that the *assessment* of sustainable development must obviously mirror sustainable development itself. Here this correlation simply adds more confidence to the presumption that the PSDF principles are indeed valid rules for sustainable development. Table 7.3 below summarises the correspondences between the Bellagio Principles and the PSDF principles.

TABLE 7.3: BALLAGIO PRINCIPLES COMPARED TO THE PSDF PRINCIPLES  
(Hardi & Zdan, 1997; Appendix C16)

<b>BELLAGIO PRINCIPLES</b>	<b>PSDF PRINCIPLES</b>
1. Guiding vision and goals	Reflected in the Vision and Values of the Framework
2. Holistic perspective	Principles 1.2, 1.3
3. Essential elements	Principles 1.2, 1.3, 2.1, 2.2, 3.1, 3.2
4. Adequate scope	Principle 1.2
5. Practical focus	?
6. Openness	Principles 5.2, 5.3
7. Effective communication	Principles 3.3, 3.4
8. Broad participation	Principles 3.3, 3.4
9. Ongoing assessment	Principles 5.2, 5.3
10. Institutional capacity	Principles 5.1, 5.2

As a further point of mutual reinforcement, it may be noted that the hierarchical structure of the PSDF, which requires that the lower level components of the framework (e.g. measurement and applications) conform to the prescripts of the higher levels (e.g. vision, values and principles), is also reflected in the hierarchical structure of the Bellagio principles.

From Table 7.3 one may also notice that the one instance where the Bellagio and PSDF sets of principles do not conform concerns Bellagio principle 5, which makes explicit the requirement for a practical focus. This exception will be discussed further in the next sub-section.

### 7.2.3 A practical focus

As has been mentioned the Bellagio requirement for a practical focus is not included as such in the PSDF principles. Engineers, by and large, pride themselves on the practicality of their designs and constructions. One could imagine that after long, abstract and maybe inconclusive theoretical debate, engineers might say, “Right, now let’s be practical – let us do the following ...”, whatever it may be. Thus, the inclusion of such a practical focus requirement into the PSDF would certainly resonate with a technically minded target group. But to be less mundane, an argument could also be made for the adoption of a practical focus requirement, in *principle*. Many of the principles in the PSDF could be seen as somewhat idealistic. For example, the principle of holism calls for the inclusion of *everything*, but clearly in the world of everyday living, such a requirement is not only impractical but well-nigh impossible. To take another example, the carrying capacity principle appears very sensible from a theoretical perspective, but when it comes to its practical application it is not always so easy to apply. If, as has been suggested in this study, the environmental and social imperatives are urgent and pressing, and if sustainable development is to be the vehicle for change with respect to our *present* practices, the requirement for a practical focus principle, which simply means *pressing on, but with circumspection*, seems adequately justified. Its message (if one may paraphrase the precautionary principle) is that long, theoretical debates or other implementation restraints should not be used as an excuse for not trying to getting things done as expeditiously as possible. In this more fundamental sense then, the practicality focus or principle could be said to be an expression of the pragmatic stance, a key perspective that has guided much of the thinking in this study that led to the formulation of the PSDF.

Some may balk at the idea of practice continuing in the absence of theoretical justification. But this is not quite what the pragmatic approach, or practicality focus is saying. It is saying that in urgent circumstances some practical actions need to be taken even if the theory behind such actions is not crystal clear. It is not saying that any of the sustainable development principles,

or any good practice guidelines, such as taking cognisance of uncertainties and risks, must blatantly be ignored.

Given this reasoning then, the PSDF suite of principles will here be extended by the inclusion of a principle of practicality under the institutional dimension (see Appendix C16). This *principle of practicality* is formulated around the issues mentioned in the corresponding Bellagio principle, while also borrowing wording from a publication, *Guidance on Sustainability*, published by the Engineering Council of the UK (ECUK, 2009: 5).<sup>266</sup> It is proposed that it reads as follows:

***The practicality principle***

*In order to respond expeditiously and pragmatically to environmental and social challenges sustainable development approaches need to be based on:*

- an explicit framework that links vision, values and principles to indicators and assessment criteria*
- a limited number of key issues for analysis*
- standardising wherever possible*
- a pluralistic approach*
- awareness that there are inherently conflicting and un-measurable aspects of sustainability*
- assessment of the risk involved.*

#### **7.2.4 Indicator themes in the proposed sustainable development framework**

It is clear from the preceding discussions and the literature that a standard suite of sustainability indicators, that is universally applicable, would be hard, if not impossible, to find. Hence, as has been suggested earlier, an attempt to include such a suite into the proposed sustainable development framework would prove to be somewhat futile. In this connection Parris and Kates conclude that

to date, there are no indicator sets that are universally accepted, backed by compelling theory, rigorous data collection and analysis, and influential in policy. Why is this so?

[They] offer three major reasons:

1. the ambiguity of sustainable development;
2. the plurality of purpose in characterizing and measuring sustainable

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<sup>266</sup> See also §10.2.2.4.

development; and,  
3. the confusion of terminology, data, and methods of measurement. (2003: 581)

This conclusion is based on studies that have compared the ways in which different countries and agencies have attempted to measure sustainable development. However one such study has shown that there is, despite wide differences between indicator sets, a reasonable measure of convergence around the *themes* on which the various indicators are based. Hass, Brunvoll and Hoie (2002) came to this conclusion having made a comparisons between ten countries and also the European Union. They based their comparison on a list of categories or themes developed by the UN. Given this background it is argued here that indicator or measurement themes are more suitable for inclusion in the PSDF than are indicators *per se*. Furthermore it is contended that the list of themes identified by Hass, Brunvoll and Hoie have not only a sufficiently wide, but also an international acceptance to warrant their inclusion in the PSDF. A caveat would be that not all of the themes are employed by all the countries included in the comparison made by Hass, Brunvoll and Hoie, and furthermore that the indicators sets categorised under these themes in the comparison do show considerable variation. But if this list of themes is treated as a check list or guideline, which does not necessarily pretend to be exhaustive or prescriptive, and if it is remembered that entries at the lower levels of the PSDF always have more of an advisory rather than mandatory nature, the inclusion of this list in the PSDF can surely be an adequate starting point on the topic of measurement. This list of themes is presented in Table 7.4 and as such, it will be included, in full (with minor additions to be discussed later), into the PSDF, but based on the discourse above the name of the descriptor will be changed to *Measurement themes*<sup>267</sup> (see Appendix F).

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<sup>267</sup> Previously the proposed descriptor was *Measurement/Indicators*

TABLE 7.4: SUSTAINABLE DEVELOPMENT INDICATOR THEMES  
(After Hass, Brunvoll & Hoie, 2002: 16-18)

<b>Environmental Sustainability</b>	<b>Social Sustainability</b>	<b>Economic Sustainability</b>	<b>Institutional Sustainability</b>
<b>Atmosphere</b> Climate Change Ozone Layer Depletion Air Quality  <b>Land</b> Agriculture Forests Desertification Urbanization  <b>Oceans, Seas, and Coasts</b> Coastal Zone Fisheries  <b>Fresh-Water</b> Water Quality Water Quantity  <b>Biodiversity</b> Ecosystems Species Alien species  <b>Pollution</b> Acidification Toxic contamination	<b>Equity</b> Poverty Gender Equality  <b>Health</b> Nutritional Status Mortality Sanitation Drinking Water Healthcare Delivery Lifestyles & illnesses Pollution related illnesses  <b>Education</b> Education level Literacy  <b>Housing</b> Living Conditions  <b>Security</b> Crime  <b>Population</b> Population Change  <b>Culture</b> Ethnic Minorities Cultural Heritage Participation in arts & recreation	<b>Economic Structure</b> Economic Performance Trade Financial Status  <b>Consumption &amp; Production Patterns</b> Material Consumption Energy Use Waste Generation/Management Transportation Tourism	<b>Institutional Framework</b> Strategic Implementation of SD International Cooperation  <b>Institutional Capacity</b> Information Access Communication and Infrastructure Science and Technology Disaster Preparedness and Response

Although the issue of employment does feature in some of the indicators sets reviewed by Hass, Brunvoll & Hoie, it has not emerged as a common concern. This may not be altogether surprising as the indicator sets they reviewed are essentially from developed countries where advanced social security systems help to counter the societal impact of unemployment. In developing countries where social security services are meagre and stretched, unemployment is much more of a societal problem, and one would expect that it must contribute, to a larger or lesser degree, to other societal problems, such as poverty and crime. In South Africa not

only are the unemployment levels uncomfortably high,<sup>268</sup> but the associated problems of crime and social instability are very much in evidence. It thus stands to reason that in countries like South Africa, employment indicators would be considered not only integral, but crucial to any sustainability assessments. Hence, in the PSDF, unemployment will be included, under the social dimension, as an additional measurement theme.

While this concludes, for the moment, the discussion on the measurement of sustainable development by means of indicators, and the way it is to be handled in the PSDF, the topic will surface again briefly in §8.4.3. For the moment attention is turned to the operationalisation of sustainable development through what is here termed applications in sustainable development.

### 7.3 APPLICATIONS IN SUSTAINABLE DEVELOPMENT

The last level in the proposed sustainable development framework deals directly with what could be characterised as sustainable development put into practice, and which, loosely can be thought of as the procedures one needs to follow on the ground in order to progress towards a sustainable state. These procedures could be in the form of guidelines or methodologies, and in the PSDF they are collectively designated as *applications*. While the holistic principle implies that all human activities should conform to the norm of sustainability, the focus here is on those activities or procedures of which the sole, or prime aim, is explicitly to promote sustainable development. These procedures, or applications as they are called here, will use a set of sustainability indicators in a certain structured way in order to make some assessment of sustainability. These applications can range from formal methodologies (e.g. environmental impact assessments) to more broadly aimed sets of guidelines (e.g. sustainability codes of conduct). One could expect that there would be many different ways of promoting sustainable development. If at the level of indicators the range was found to be so wide so as to preclude their entry into the PSDF, other than in a very generalised thematic format, then there is no reason to believe that the range at the level of applications should not be even wider, given that most applications only use a relatively small number of the available indicators. So again the entries made at this level in the PSDF

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<sup>268</sup> The 2013 OECD *Environmental Performance Review of South Africa* (<http://www.oecd.org/southafrica/>) shows the South African unemployment rate (2011) to be hovering at 25%, compared to unemployment rates of under 10% for Chile, Turkey, Brazil, and Mexico.

can at best only be indicative, and hence by no means exhaustive. They simply represent a selection of different ways in which society (or professionals) could attempt to operationalise sustainable development.

Many applications in the field of sustainable development do not assess sustainability *per se*, but mostly only some aspects of sustainability, and often the assessment is descriptive rather than numerical. For example, the application known as *triple bottom line* reporting, is usually a firm's report on its performances in certain selected social and environmental areas, over and above its economic performance, and as a rule, it does not assess sustainability as such. A *social impact assessment* usually only reports on, as the name suggests, the socio-economic impacts of a development. A *sustainability code of conduct* usually makes no assessment of sustainability at all, but rather it prescribes the ways in which professionals should conduct their professional activities in order to promote sustainable development. Obvious reasons for these manifold approaches that vary in focus and depth is again the ambiguity and complexity around the concept of sustainability, and these approaches reflect the many ways in which society is trying to grapple with the concept. It may thus be concluded that the field of sustainability applications is an evolving one, in which not only the range of applications is changing, but the applications themselves are also changing, with some maturing while others become obsolete, all of this indicative of society's evolving understanding of sustainable development. Another reason for the variation in sustainability applications is that most have emerged in a specific discipline and hence often retain a leaning towards that discipline. On the other hand, there are methodologies that represent concerted attempts to move beyond disciplinary boundaries, in order to assess sustainability more holistically. This means that the dimensional arrangement of applications as shown in the PSDF can be misleading and inaccurate. Thus, if previously in this study the dimensional categorisation of sustainable development has been downplayed, it can be said now, that at the level of applications, these categories are even less significant.

It has already been noted that when sustainability indicators are presented as is, in a type of 'scoreboard' approach, it is very difficult to arrive at a clear-cut conclusion, particularly when the indicator set is large (hundreds). This has been a major motivation towards the development of indices, the ideal being where sustainable development is assessed through a single index. It may be argued that as an index employs a number of indicators in a specific way it has itself become an application, and hence that it belongs in the *Applications* category of the PSDF rather than in the *Measurement* category.

This simply reaffirms the flexibility of the PSDF at its lower levels, and it will profit little to debate lengthily at which of these levels indices should slot in. Of more concern is the dubious scientific validity, and the lack of general legitimacy of many indices, and as a result this has led to the development of more elaborate methodologies for sustainability assessment. The large array of such methodologies or applications that are already available, makes some sort of ordering or categorisation (other than through the dimensions of sustainable development) desirable. While admitting that their categories were also somewhat loose, De Ridder, *et al.* decided on seven categories (2007: 428-429). With some minor amendments they are listed here below:

- *Assessment frameworks* are relatively standardised procedures, which include environmental impact assessments, strategic environmental assessments, etc., and which may also involve the use of other assessment tools.
- *Participatory tools* focus on identifying and involving stakeholders.
- *Scenario analysis tools* are used to foretell and understand possible future developments.
- *Multi-criteria tools* attempt to identify the most desirable options using various quantitative and/or qualitative criteria, the units of which are non-compatible.
- *Economic analysis tools* are usually based on monetised assessments of the costs and benefits of an activity.
- *Physical analysis tools and indicators sets* are based on (i) assessment of physical components of the environment, e.g. ecological footprinting, or on (ii) indicator sets that assess wider issues such as poverty and hunger.
- *Modelling tools* try to simulate real-world situations based on empirical data.

To this list the following may be added:

- *Regulatory tools* attempt to control activities that are considered unsustainable, and

facilitate activities that contribute to sustainability.

- *Promotional tools* are mainly educational courses aimed at promoting sustainable development.

Clearly it would be a large and time-consuming task to attempt to provide a comprehensive list of sustainability applications for inclusion in the PSDF. Every application has some limitations, and to use it requires some expertise; these and other characteristics of the applications are not easy to reflect in a list. Such a list would in any case need to be continuously updated. So instead, the list provided in the PSDF should rather be seen as some *examples* of the many applications that are available. These examples are placed in one of the dimensional categories of the PSDF, but this is somewhat arbitrary, as many applications deliberately attempt to transcend these dimensional boundaries. However most applications have their roots in a certain discipline, while some may even have an intentional area of application that falls within the scope of one of the dimensions of sustainable development. But having said that, it can be reiterated that the dimensional categorisation of the applications listed in the PSDF is by no means fundamental. It could in any case be argued that any true sustainability application should be valid across all the dimensions of sustainable development.

The brief list of exemplar sustainability applications to be included in the PSDF is as follows::

*Benefit cost analysis:* BCA is used to weigh up the monetised benefits and the costs of a project against each other.

*Ecological footprinting:* Here the land area necessary to sustain current levels of resource consumption and waste discharge, usually expressed in hectare per capita, is determined. This application is mostly used in comparative analyses.

*Environmental education:* This comprises educational initiatives, at school and post-school levels, designed to increase the environmental (broadly understood) awareness of students. Some such educational offerings are specifically aimed at promoting sustainable

development.<sup>269</sup>

*Environmental impact assessments:* EIAs are procedures designed to predict and assess the impact of proposed development activities on the environment (originally the focus was mainly on the natural environment but latterly the social and economic environments have featured more and more prominently in these assessments).

*Environmental law:* This is law (and policy) that deals mainly with the natural environment, but to the extent that it also focusses on sustainable development, the broader understanding of the environment is also relevant. (The next chapter will be devoted to discussion on this topic.)

*Gross domestic product:* The GDP of country is the annual market value of all the goods and services produced and often, for comparative purpose, expressed per capita.

*Human development index:* The HDI was developed by the UN as a measure of human development based on longevity, knowledge and income.

*Life cycle analysis:* LCA is a technique to assess environmental impacts over the full life span of a product or a project. All stages from inception through design, construction, commissioning, operation to decommissioning are considered. It is also described as a cradle-to-grave approach.

*Multi-criteria decision analysis:* MCDA is procedure which allows the simultaneous use of diverse quantitative and qualitative criteria in order to assess the desirability and the sustainable value of a project.

*Social impact assessment:* SIA is focussed on the impacts of a proposed development on society and it is often executed as part of a broader EIA.

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<sup>269</sup> The Nelson Mandela Metropolitan University (NMMU) claims that it is “the only university in South Africa to offer the new trans-disciplinary science of Earth Stewardship.” (Available at <http://news.nmmu.ac.za/News/NMMU-leads-way-with-launch-of-new-climate-science> [accessed on 25 April 2013])

*Strategic environmental assessments:* SEAs are carried out on proposed policies and programmes in order to determine the environmental opportunities and constraints for geographical regions or industrial sectors.

*Triple bottom line:* TBL reporting is an approach adopted by companies in which their annual reports not only reflect their economic performance but also their social and environmental performances.

With the inclusion of the above sustainability applications into the PSDF (see Appendix F), its development, in terms of this study, is nearing completion.

#### **7.4 A PROPOSED FRAMEWORK FOR SUSTAINABLE DEVELOPMENT**

In the preceding chapters the concept of sustainable development has been subjected to a deep and wide-ranging investigation. In view of the serious environmental and social (and lately also economic) problems that have to be faced across the world, sustainable development is being promoted as the appropriate paradigm in which to frame our responses to these problems. For reasons that have been mentioned, the concept of sustainable development has achieved levels of popularity and acceptance that are hardly matched by any other new societal guideline concept in modern times. Yet, despite its wide appeal, the concept remains vague and lacking in universal definition; it is not readily operationalised either. These are drawbacks which, in the eyes of some, make the notion of sustainable development fatally flawed. The argument being put forward here is that the popularity of the concept is an advantage of such value that it cannot be discounted. Instead it is the weaknesses inherent in the vagueness of the concept that should rather be addressed.

Being a broad and an evolving concept the attempts to define sustainable development succinctly have so far been inconclusive, and probably will remain so for the foreseeable future. The broader thrust and meaning of the concept is much better conveyed, it is argued here, through a framework which proceeds from, at the higher levels of its hierarchy, deep fundamental truths, universally held, to operational methodologies and applications at its lower, more flexible levels. Of these lower level components some may be logical and readily acceptable, but others are more contentious and

experimental. In the light of the last comment the framework cannot be completely conclusive, but it too will, particularly at the lower levels of its hierarchy, evolve with time and adapt to new insights as they are developed. Nevertheless it does contain, at its higher levels, values and principles which are foundational, fixed and near universal. A prototype of such a framework of sustainable development has been developed in this study and it is presented in Appendix F. This proposed sustainable development framework (PSDF) is generally applicable, but in the context of this study it is its relevance to engineering, and in particular to civil engineering, that will be pursued. Thus for much of what is to follow, the PSDF will be a point of reference.

This study now proceeds to the more practical aspects of sustainable development, in particular as it is evidenced in a South African context. As a first step it will, in the next chapter, focus on the body of policy and legislation that relates to sustainable development in South Africa.

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## **SECTION C**

### **SUSTAINABLE DEVELOPMENT IN SOUTH AFRICA**

All stakeholders have responsibilities in regard to the implementation of sustainable development programmes, but the primary responsibility for co-ordination and implementation rests with governments. (Terry, 2008: 117)

Acknowledging the many serious environmental (broadly perceived) problems that society is being confronted with, this study has honed in on sustainable development as the way forward. This has culminated in a multi-faceted conceptualisation of sustainable development that has been articulated through the framework presented in Appendix F. Having thus nailed its colours to the mast of sustainable development, this study will proceed by next investigating the South African responses to the concomitant responsibilities mentioned by Terry here above. Firstly, in Chapter 8, the government's response through legislation and policy will be scrutinised. And then, in Chapter 9, the response of the public (which includes the engineering profession) will be investigated by working through two case studies.

## CHAPTER 8

### THE ENVIRONMENTAL LAW AND POLICY FRAMEWORK IN SOUTH AFRICA

If, however, the free market approach to environmental problems is rejected in favour of sustainable development, then substantially increased state intervention will be required in order to promote both intergenerational and intragenerational equity. In South Africa's case, environmental issues have been (directly or indirectly) the subject of a wide variety of legislative measures: some 60 parliamentary acts and several hundred provincial ordinances and local by-laws, as well as some 30 international agreements. (Lumby, 2010: 75)

Two conditions must be present to permit sustainable development to become an objective of national policy and development planning. First, there must be a politically-effective constituency for such a policy. Second, persons holding power of decision in governments must have the incentive to favour a long-range sustainability over short-range expediency. In very few countries do either of these conditions prevail, and in many of them exceptions and contradictions occur.

Neither of these conditions is probable, unless a third is also present. This is an ecological-ethical ideology with explicit political expression. (Caldwell, 2001: 1746)

Given the sentiments that emerge in the above quotations this chapter will attempt an overview of the relevant South African policy statements and legislation, while also probing the “ecological-ethical ideology” within the framework of its “political expression”, or the lack of it.

#### 8.1 INTRODUCTION

Apart from sharing in global environmental problems, South Africa also has its measure of local environmental<sup>270</sup> problems – to list a few:

- soil erosion
- limited water resources
- acid mine water
- rhino poaching
- land invasions
- marine resource depletion (abalone).

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<sup>270</sup> Here, and in most of this chapter, the environment will be interpreted more narrowly as the *natural* environment.

Apart from environmental problems as such, the environment also has value for society. Typical values include the following (Glavovic, undated: 3-4):

- *economic*: environmental resources, tourism, etc. which contribute to the economy
- *scientific*: the environment is seen as a laboratory for scientific research
- *food*: water, plants and animals which provide sustenance for humans
- *ecological services*: services such as climate regulation and waste assimilation that are often taken for granted, but which are crucial for human well-being
- *cultural*: the environment serves as an educational and spiritual resource
- *biodiversity*: a rich biodiversity contains e.g. undiscovered medicinal sources, and also promotes planetary health
- *raw materials*: this includes the materials needed for industry, housing, etc.
- *recreational*: hiking, camping, fishing, game-viewing, etc., all pre-suppose a non-degraded natural environment
- *psychological values*: natural areas provide a refuge from societal pressures
- *aesthetics*: nature provides beauty and peace, and for some opportunities for creativity.

These values translate into what is known as natural capital. One of the reasons why societies legislate is to protect that which is of value to them. Thus one would expect, that in any given country, a body of environmental legislation will evolve, the aim of which is to protect its natural capital. The extent to which this legislation is absent or inadequate presents another form of environmental problem.

The excuses offered for enduring environmental problems, include the lack of available finances with which these problems can be addressed, and in this regard some call for higher levels of economic growth. It is argued that economic growth provides the financial resources that are needed to protect the environment from degradation, and hence secure the values that it holds for us. In discussing a 'rich heritage' scenario for South Africa, Huntley, *et al.* call for

a robust economy and a politically stable community [which] will provide the means and commitment required for the wise use of natural resources. (1989: 113)

Indeed economic growth is a target of the SA economic policies, but the previous chapters have reflected to some extent on the inadequacy of economic growth as a sustainability strategy. That some growth is required is not disputed, but it needs to be recognised, that growth is limited by physical limits and that the free market system can in fact be a contributor to some of the environmental

problems listed here above.

The message of the prefatory quotations is firstly, that free markets fail to protect the natural environment, and hence that government interventions, usually in the form of legislation and policies, are required. And while Lumby indicates that there has been a generous response in terms of the number of environmental policies and laws tabled in South Africa, Caldwell cautions that that isn't enough. And so secondly, it is also stated that for such government interventions to be effective, political will and a long term perspective are required. Moreover, even with these preconditions in place, society needs to adopt, according to Sterling, an ecocentric frame of reference, an "ecological world view" (1990: 77). While the present *zeitgeist* is perhaps more favourable now than ever before for the development of such a world-view, the capitalist/growth paradigm still rules, and hence the undiminished need for a national environmental policy framework to facilitate sustainable development, and to act as some kind of a brake on unbridled capitalism.

This chapter will be devoted to a discussion of environmental policy and law in South Africa – not with the object of giving a detailed account of all these policies and laws,<sup>271</sup> but rather it will be a focussed overview. The focus will be on how the policy/legal framework in South Africa promotes sustainable development, particularly given the broad understanding that was developed for this concept in the previous chapters, and which is reflected in the proposed sustainable development framework (Appendix F). Thus the heading to this chapter, which refers to *an environmental law and policy framework*, should perhaps more appropriately be, *the environmental law and policy framework as it relates to sustainable development*. In many countries it is in their body of environmental law and policy that sustainable development is promoted. But before the South African situation in this regard is discussed, a general discourse on the nature of environmental law might be insightful for the later deliberations (see the next sub-section).

To conclude this introduction it might be worthwhile noting that in South Africa it is the Department of Environmental Affairs (DEA) that deals with environmental issues. For some it could be worrisome that the DEA is part of a joint ministry with the Department of Water Affairs,<sup>272</sup> to the extent that this might indicate a lesser priority being accorded to the environment. An even more concerning pairing

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<sup>271</sup> There are excellent resources available in this regard. (See Glasewski, 2006 and Kidd, 2008.)

<sup>272</sup> It might be more reassuring that since the General Election of 2014, the DEA exists as a separate department.

occurs in the Eastern Cape Province where environmental affairs is combined with economic development. The concern is that in these situations the importance of sustainable development is downgraded, such as becoming an adjunct of economic growth. While, in the case of the national government, it appears that sustainability as a policy or strategy does resort under the DEA, it could be argued that sustainable development merits a more prominent profile in the government structures; maybe even a department in its own right. Given the holistic thrust inherent to sustainable development, it could be argued that sustainable development should be the principal policy or strategy of the government, and that as such it should inform all other policies and strategies. However one must acknowledge that such a scenario would be quite unique amongst the countries of the world. Furthermore the DEA does position itself quite broadly as follows:

#### Vision

A prosperous and equitable society living in harmony with our natural resources.

#### Mission

Providing leadership in environmental management, conservation and protection towards sustainability for the benefit of South Africans and the global community.<sup>273</sup>

Thus while there may be concern around the government structural undervaluing of sustainable development, the above vision and mission statements do soften this concern.

## 8.2 WHAT IS MEANT BY ENVIRONMENTAL LAW?

Environmental law and policy is one of those instances where the use of the term *environment* has in general been pared down to refer almost exclusively to nature, that is to say, it focusses mainly on the natural and bio-physical environment. This is the way in which environmental law has developed – if the wider meaning of the environment were to be employed then all law would be environmental law, and the term environmental law would become redundant. Thus the narrower interpretation being applied to environmental law not only makes logical sense to jurists, but as such, it is also a useful descriptor for them for a particular branch of the law. And so it is generally accepted that environmental law has to do with the natural environment. That is not to say that environmental law has distinct and

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<sup>273</sup> Available at [https://www.environment.gov.za/?q=content/about\\_us/overview\\_department](https://www.environment.gov.za/?q=content/about_us/overview_department). [Accessed on 30 April 2013]

non-porous boundaries. According to Rabie:

It is significant that while most commentators agree on the central core of environmental law, there is some difference of opinion as to peripheral areas, displaying a degree of arbitrariness in the treatment of the subject matter. (1992: 96)

In Kidd's opinion,

any legal principle that relates to environmental management, whether directly or indirectly, or which has actual or potential impact on the environment, should fall within the purvey of environmental law. (2008: 6)

For Kidd then environmental law deals mainly with environmental management, which in short, addresses issues at the human/environment interface. According to Glasewski (2006: 9-10) these issues can be grouped into the following three main areas:

- Land use planning and development  
This deals with issues such as EIAs, strategic environmental assessments (SEAs), land tenure, etc.
- Resource conservation and utilisation  
This covers all natural resources such as indigenous plants and forests, wild animals, birds, marine life, etc.
- Waste management and pollution control  
Landfills, hazardous and medical waste, air pollution, etc. are the typical issues covered here.

Despite this delineation Rabie speculates that environmental law might simply be a “potpourri of legal norms encountered in a number of conventional fields of law” (Glasewski, 2006: 10). To give more structure then to the field of environmental law, and to give this field of law its own identity, some commentators describe the legal principles that are peculiar to this field, and use these to form a core around which the laws and policies in this field can cohere. In the next sub-section then, it is these principles of environmental law which will be the topic of discussion, also to the extent that they may be considered principles of sustainable development.

### 8.3 PRINCIPLES OF ENVIRONMENTAL LAW

Being a fairly recent development in law, environmental law is still evolving and its principles are still in the process of taking root, meaning that some will grow into fixed, universal principles of the discipline, others will wither and die, and new ones might still be added. However both Glasewski (2006) and Kidd (2008) have identified a number of reasonable well defined and understood principles and concepts, that are, at present, generally accepted as the core of environmental law. Table 8.1 will make a comparison between these principles and those principles that have been included in the proposed sustainable development framework (PSDF) and are set out in Appendix C16.

TABLE 8.1: PRINCIPLES OF ENVIRONMENTAL LAW

<b>Principles of Environmental Law</b>	<b>Glasewski 2006: pp. 12-20</b>	<b>Kidd 2008: pp. 7-11</b>	<b>PSDF Principles App. C16</b>
Sustainable development	✓	✓	§1.3
Environmental justice	✓	✓	§3.1, 4.2 & 4.3
Human right to a decent environment	✓		§3.1
Inter-generational equity	✓		§1.2
The public trust doctrine	✓	✓	§2.2
The precautionary principle	✓	✓	§2.3
The preventive principle	✓	✓	§2.4
The polluter pays principle	✓	✓	§4.3
Local level governance	✓		§3.3 & 5.2
Common but differentiated responsibility	✓		§3.5
Duty of care to avoid harm to the environment		✓	§2.2, 2.4 & 2.5
Life cycle responsibility		✓	§4.3
Principle of co-operation		✓	§5.2, 5.3 & 5.4

While both Glasweski (2006) and Kidd (2008) mention *sustainable development* as a principle that “underpins” environmental law, they nevertheless list it as a principle *of* environmental law. In similar style NEMA lists sustainable development as a principle *of* environmental management. At the risk of

being overly semantic, it is contended here that the presentation of sustainable development as principle *of* something else tends to downgrade it as a concept. The presentation of sustainable development as a framework of vision, values, principles, etc., as is proposed in this study, suggests a far more fundamental status for the concept. At this more fundamental level of conception, environmental law is but one application of sustainable development, rather than the other way around. However that which Kidd and Glasweski may wish to capture in their principle, the three-dimensional nature of sustainable development and the need for integration across these dimensions, is covered by principle §1.3 of the PSDF principles. The argument made here, for sustainable development to be accorded the primary position, is reinforced by the principles which follow on in the above table. They are, more logically, principles of sustainable development, rather than of the environment (in the context where environmental law is understood to refer to the natural environment).

The *environmental justice* principle of environmental law has both positive and negative connotations. Positively it requires equity in access to environmental resources, and negatively it requires that people should not simply, because of their station in life, disproportionately suffer the effects of environmental degradation. The PSDF principles cover these aspects in the recognition of environmental rights (§3.1), the call for equity (§4.2) and also by implication in the user pays principle (§4.3).

The *human right to a decent environment* arises out of the application of the environmental justice principle. It is spelt out in some detail in Section 24 of the Bill of Human Rights that forms part of the South African Constitution, where it is stated that:

Everyone has the right-

- (a) to an environment that is not harmful to their health or well-being; and
- (b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that-
  - (i) prevent pollution and ecological degradation;
  - (ii) promote conservation; and
  - (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development (South Africa, 1996: S24)

These sentiments are covered in principle §3.1 of the PSDF.

The *inter-generational equity* principle has been, at least since the publication of the Brundtland report, seen as an integral component of sustainable development. It is implied by many of the principles in

the PSDF, but more explicitly it is a component of the holistic principle (§1.2).

The *public trust* doctrine originates in Roman law and requires, in effect, not only that certain environmental assets be kept in trust for public use (with the government being the trustee), but also that it be done in perpetuity for the benefit of future generations. This means that these assets cannot become private property. Typically this doctrine finds expression in the creation of national parks and other protected areas. This doctrine underlies the conservation principle (§2.2) of the PSDF.

The *precautionary principle* is a risk averse approach, in that it disallows actions which could have serious negative effects on the environment, even if these effects are scientifically unproven. In other words, the lack of scientific proof may not be used as an excuse to continue with such actions, or to not institute actions that protect the environment. This principle should obviously be applied judiciously, as there are many activities the environmental consequences of which cannot be predicted with great accuracy, and yet can one demand that all such development activities be stopped? The answer hinges around the interpretation of ‘*serious negative effects*’. In the case of the Wild Coast Toll Road,<sup>274</sup> for example, some environmentalists insist that its unpredictable environmental impacts demand that the road be rerouted, while the proposers argue that the environmental impacts will not be too serious. The precautionary principle is recorded as principle §2.3 of the PSDF.

The *preventive* principle requires that environmental degradation should be prevented. As is the case with the previous principle, this principle too cannot be applied in an absolute sense. Virtually all human activities have negative impacts on the environment, and yet they cannot all be stopped. In practical terms the impacts have to be minimised and managed. Therefore the principle is probably more appropriately named as the minimum impact principle, as it is in the PSDF.

The *polluter pays* principle requires that any person who pollutes the environment should pay the costs of remediation (or alternatively the costs to prevent such pollution). The PSDF takes this idea a step further by suggesting that also those who derive any material benefits from the exploitation of the environment should pay for those benefits. In this broader conceptualisation the principle has been named the user pays principle (§4.2). On the basis of this extended principle one can then, for example, justify fishing and hunting permits which levy pro rata charges for the amount of fish or animals

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<sup>274</sup> See §9.2 for a more extensive discussion on the Wild Coast Toll Road.

harvested.

The *local level governance* principle in environmental law requires that people should be involved in the decisions that affect their lives, and in the PSDF this notion is incorporated into the participation and effective governance principles (§3.3 & §5.2). The *common but differentiated responsibility* principle is often applied at the international level where it usually means that the developed countries have to assume a greater responsibility than the developing countries, with respect to addressing the environmental problems of the world. This is justified on the grounds that these countries not only have more resources and skills at their disposal, but in addition they often are also the main contributors to these environmental problems. The principle can also be applied at local levels where it simply means that, in any mitigation activities, the advantaged need to assume greater responsibility as compared to the disadvantaged. In the PSDF this principle is simply termed the responsibility principle (§3.5).

The *duty of care to avoid harm to the environment* principle which “imposes on every entity the duty to act with due care to avoid damage to others or to the environment, or where impact on the environment is unavoidable, to mitigate harm” (Kidd, 2008: 10) is not expressed in these words in the PSDF. It is however well covered under such principles as the conservation, the minimum impact, and the anti-cruelty principles (§2.3, §2.4 and §2.5). It could also be argued more generally that it is, in any case, the rationale for the whole set of principles in the environmental dimension, as expressed by the dimensional goal of preserving the integrity of the environment.

The *life cycle responsibility* principle requires that persons responsible for producing toxic and dangerous substances remain responsible for them until they cease to be such. It can also be more widely applied in that the environmental impacts of any development must be anticipated over the whole life cycle of the development, that is from conception through to decommissioning, in the so-called ‘cradle to grave’ approach. In practice it is expressed through a methodology known as life cycle analysis (LCA). In the PSDF LCAs are included under the user pays principle (§4.3).

The environmental law principle of *co-operation* between all parties, and particularly also between the public and the private sectors, and between countries, is included in the PSDF as the effective governance, the corporate responsibility, and the global principles (§3.2, §5.3 and §5.4). International environmental law would be of little consequence without this principle. Unlike the national laws

which are applicable within the jurisdictions of sovereign countries, agreements reached on the international stage are not always easily monitored or enforced, and hence rely very much on the principle of co-operation for their effective implementation.

So it can be seen from the above that all the principles considered by Glasewski and Kidd to be applicable in the field of environmental law, are also included, in one form or another, in the principles of the PSDF, thus once again reaffirming the credibility of the PSDF.

## **8.4 SOUTH AFRICAN ENVIRONMENTAL LAW AND POLICY**

Environmental law and policy can be of a general nature, covering broad environmental principles and objectives. On the other hand, it could also be more particular, such as when it addresses specific environmental issues. Issues such as air pollution or fishing quotas may be examples in this latter category.<sup>275</sup> It is the former, general category that is of more relevance to this study, and hence the focus in this sub-section will fall on South African laws and policies that fall into this category. Two pieces of legislation that can be regarded as being of this general, overarching nature are the South African Constitution and the National Environmental Management Act.

### **8.4.1 The South African Constitution (Act 108 of 1996)**

The South African Constitution is regarded as the supreme law of the land, and to have an environmental right enshrined at this level, which while “by no means unique”, is very advantageous as “most countries which have well developed systems of environmental law do not have such a right” (Kidd, 2008: 18). The value of this constitutional environmental right should not be underestimated as it not only grants each citizen the right to decent environment, it also places an imperative on government to use “legislative and other measures” to give effect to this right, particularly in the areas of environmental degradation, conservation and sustainable development.

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<sup>275</sup> South African examples here are the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) and the Marine Living Resources Act, 1998 (Act No. 18 of 1998).

The environmental right is contained in Section 24 of the Bill of Rights of the South African Constitution, and it has already been quoted in full here above (see §8.3, or South Africa, 1996: S24). Three observations on this clause might be apposite here. Firstly from the requirement that “the environment [is to be] protected, for the benefit of present and future generations”, an anthropocentric slant is detected, from which one may draw the conclusion that the legislators did not value the environment intrinsically, but rather only saw the instrumental value it had for humans. While some environmentalists may have principle objections to an anthropocentric bias, this study has already committed to the pragmatic approach which would not be overly concerned about such theoretical reservations, provided that the environmental practice that ensues still protects the environment. In the case on hand, pragmatists would rather focus on the practical benefits that would accrue to the environment through the implementation of the above extract from the Constitution. Secondly, this extract also exhibits a long-term perspective in its concern for “future generations” (and by implication for the present generation too), which would resonate well with the long-term view inherent to sustainable development. The third observation on the environmental clause in the Constitution is that it represents, one may deduce, a strong political commitment to the notion of *sustainable development*. This emerges from the injunction (addressed, by implication, to the government) to introduce measures to:

- (i) prevent pollution and ecological degradation;
- (ii) promote conservation; and
- (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development. (South Africa, 1996: S24)

It can be stated with confidence that nothing in the PSDF negates the letter or the spirit of the environmental right (and its commitment to sustainable development) enshrined in the SA Constitution.

There are also other rights contained in the SA Bill of Rights that can be used directly or indirectly to promote environmental integrity or sustainable development, and these too are evident, some perhaps more explicitly than others, in the PSDF. The rights referred to here include, *inter alia*:

- (a) Rights that can be used in support of the environmental right:

- S32,<sup>276</sup> the access to information clause
- S33, the just administration clause
- S38, the *locus standi* clause.

(b) Basic human rights that can be negated by negative environmental conditions:

- S9, the right to equality
- S10, the right to human dignity
- S11, the right to life
- S14, the right to privacy.

(c) Socio-economic rights relevant to sustainable development:

- S25, property rights
- S26, the right of access to adequate housing
- S27, the right of access to sufficient food and water
- S27, the right of access to health care services
- S28, the rights of children to basic nutrition and shelter.

The rights listed in (b) and (c) above are self explanatory, but those listed under (a) may need some more elaboration:

#### *8.4.1.1 The access to information clause*

This clause of the Constitution guarantees any person the right of access to any information held by the state and any information that is held by another person that is required for the protection of any rights. The Promotion of Access to Information Act, No 2 of 2000, has been passed to give more detailed effect this right.

The right to information is important for one to exercise one's environmental rights. For instance where one's environmental rights are being impinged upon by a mining operation one is entitled to, for example, information related to the conditions the government may have imposed when the approval to mine was granted, and information from the mine with

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<sup>276</sup> The numbers in this listing refer to the relevant section or clause numbers in the SA Bill of Rights (South Africa, 1996).

respect to the contaminant levels of its effluent. Without access to the proper information the value of public participation is greatly reduced, and in extreme cases one's chances of a successful litigation could be severely compromised.

#### 8.4.1.2 *The just administration clause*

This clause states that:

- (1) Everyone has the right to administrative action that is lawful, reasonable and procedurally fair.
- (2) Everyone whose rights have been adversely affected by administrative action has the right to be given written reasons for the decision. (South Africa, 1996: S33(1) & (2))

Administrative action refers to decisions made by the state and representatives of the state. Environmental conflicts can often be the result of maladministration, for example as might be the case with issuing of fishing rights. In terms of this clause the government is also required to enact legislation to give further effect to this right, and this was done through the Promotion of Administrative Justice Act, No 3 of 2000.

#### 8.4.1.3 *The locus standi clause*

In the past the legal resolution of many environmental problems was complicated by the lack of legal standing of interested parties. According this clause, any person, as defined here below, may seek legal redress if any of the rights granted in the Bill of Rights are prejudiced.

The persons who may approach a court are-

- (a) anyone acting in their own interest;
- (b) anyone acting on behalf of another person who cannot act in their own name;
- (c) anyone acting as a member of, or in the interest of, a group or class of persons;
- (d) anyone acting in the public interest; and
- (e) an association acting in the interest of its members. (South Africa, 1996: S38)

There could also be a down side to this wide definition of legal standing. Murombo expresses the fear that it could lead to situations where anyone could use “environmental legislation ... to promote commercial [or any other non-environmental] interests under the veil of sustainable development” (2008: 501). Indeed the case Murombo was reporting on,

was one which had been referred to the Constitutional Court after the Supreme Court of Appeal had found in favour of the respondents who “had argued that the applicant was a competitor masquerading as a ‘green’ advocate merely in order to stifle competition” (2008: 498). However one could argue that it still remains the prerogative of the court to decide on the validity of the *environmental* or *sustainability* argument irrespective of who puts it before the court.

It can thus be seen that the South African Constitution is an important legal instrument in general, and also in particular, as regards environmental and sustainability rights.

#### **8.4.2 The National Environmental Management Act (No 107 of 1998)**

While South Africa is one of the few countries that has written environmental protection into its Constitution, it has also, in common with many countries, produced numerous other pieces of legislation that have a bearing on the environment. Of these, the National Environmental Management Act (Act no 107 of 1998, as subsequently amended, and known in short as NEMA),<sup>277</sup> is what can be termed as the senior environmental act of South Africa. It sets out the principles of environment management which not only give more substance to the environmental right granted in the Constitution, but which also guide and enable further subsidiary legislation aimed at specific environmental sectors.<sup>278</sup>

The anthropocentric bias in the focus of the Act has already been mentioned. This is clearly evident in the preamble to the Act which additionally identifies previously disadvantaged communities for special attention (South Africa, 1998). It states, for example that:

the State must respect, protect, promote and fulfil the social, economic and environmental rights of everyone and strive to meet the basic needs of previously disadvantaged communities.

It also concludes that the

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<sup>277</sup> NEMA effectively replaces the earlier *Environment Conservation Act 73 of 1989*, and hence the earlier act will not receive further mention in this report.

<sup>278</sup> For example, the National Environmental Management: Air Quality Act (No 39 of 2004).

inequality in the distribution of wealth and resources, and the resultant poverty, are among the important causes as well as the results of environmentally harmful practices;

Even the prevention of pollution and degradation of the environment, and the promotion of conservation is seen from the perspective of the human right to a decent environment and not because the environment is intrinsically valuable. Some environmentalists would regard this as a serious flaw. Norton, in reference to Callicott and Sagoff, for example, notes that they “have both argued that environmentalists should play down instrumental arguments for saving species and biodiversity, [instead] basing their main arguments on the ‘intrinsic value’ of nature” (2007: 31). However, as previously asserted, the pragmatic approach supported in this study will not regard the anthropocentrism of NEMA as a *fatal* flaw, and instead, rather build on the positive elements in the Act.

As has been mentioned, NEMA includes a substantial number of principles. These were discussed in Chapter 5, and are reproduced in Appendix C10. At that point, concern was raised about the possible limitation that can be read into the opening statement of these principles. It states that the “principles set out in ... [NEMA] apply throughout the Republic to the actions of all *organs of state* [emphasis added] that may significantly affect the environment” (Appendix C10, §1). It was then argued that the principles applied more widely than simply the organs of state, and Kidd supports this contention, by asserting that:

it is patently clear from the Act that the principles *are* envisaged as being applicable in a dispute between members of the public and anyone else, including the government, where there is a breach or threatened breach of any provision of NEMA ... (2008: 35)

Kidd argues that if this were not the case, then section 32 of the Act, which grants legal standing to any interested member of the public, would be redundant. Because of the major thrust of this study, the applicability of the NEMA principles to sustainable development is of particular interest; it is for this reason that they have been included in Appendix C17, where they are directly compared to the PSDF and Sherbrooke sustainability principles. This comparison shows that NEMA, despite the fact that it is a piece of environmental legislation, and therefore presumably biased towards the natural environment, can be, at least in terms of its principles, a strong legal underpinning for the notion of sustainable development.

A component of environmental law that is often in the public eye, is that dealing with environmental impact assessments (EIAs). It is in Chapter 5 of NEMA, under the heading of *Integrated Environmental Management*, that the EIA process is covered, also more particularly through the EIA regulations which are issued in terms of section 24 of the Act. According to these prescriptions no activity, as listed in the listing notices (also issued in terms of section 24 of the Act), may proceed without an *environmental authorisation* from a *competent authority* (usually a provincial or national department of environmental affairs). Activities are graded, and those that are of a smaller scale, or of which the environmental impacts are predictable, only require a shortened form of assessment known as a *basic assessment*, while those that are larger, or of which the impacts are less predictable, require a more extensive investigation known as *scoping and environmental impact reporting*. At the conclusion of either of these two processes, carried out under the supervision of an independent environmental practitioner, reports are to be produced which are submitted to the competent authority. It is on the basis of these reports that an activity may be authorised to proceed, and if so under what conditions. Of course, if the potential environmental impacts are severe and not amenable to mitigation, it is also possible that authorisation may be refused. It should be obvious that much of civil engineering practice will be directly influenced by the EIA prescriptions of NEMA.

NEMA also speaks to rights and obligations of individuals with respect to the environment. While the SA Constitution grants environmental rights to individuals, NEMA (South Africa, 1998) also places on them the duty of care. For example, in section 28 it is stated that: “No person may ... unlawfully and intentionally or negligently commit any act or omission which detrimentally affects or is likely to affect the environment in a significant manner.” (S28(14)) Furthermore it also specifically prohibits workers from being victimised if they, in good faith, refuse to do work that is environmentally hazardous (S29), and in similar vein also protects anyone who, in good faith, discloses information about potential environmental risks. The legal standing granted to individuals in the Bill of Rights is reaffirmed with respect to environmental matters in Section 32 of NEMA.

In all, despite some weaknesses, NEMA is a strong piece of environmental legislation – Kidd calls it “a pioneering statute” (2008: 39). Of more concern than the Act itself, are the problems around its implementation. For example, NEMA called for the submission of environmental

implementation plans (for government departments whose activities affect the environment) and environmental management plans (for government departments whose activities involve management of the environment) within one year of the promulgation of the Act, and thereafter at four yearly intervals. Apparently these deadlines have not been met, with first submissions being as late as 2003, forcing the Minister to repeatedly extend the submission dates. Kidd, speaking of NEMA, assesses the situation as follows:

Overall, this is one of many South African environmental laws that, on paper, are excellent laws. The main challenge facing the environmental authorities, in all three spheres of government, however, is ensuring that the promise of these laws on paper is translated into reality. The effectiveness of the enforcement of South Africa's environmental laws has been a concern for years and there is still concern in this regard. There are now more mechanisms for enforcement than ever before, and encouraging developments in the enforcement and compliance arena, but there is still considerable room for improvement. (2008: 39-40)

While there are many other pieces of environmental law on the South African law books, they are often, as has been said, aimed at addressing specific environmental problems or issues, and hence they are of less interest to this study. But, the two most senior pieces of legislation in this regard have been dealt with, and so it is a good time now to move on to the South African policies that relate to the environment and sustainable development.

### **8.4.3 Environmental Policy**

In a review of South African environmental jurisprudence over the last ten years Smith comes to the conclusion that

policy has emerged as an increasingly important tool for decision-makers. If clearly drafted and appropriately applied, well-utilised policy increases the likelihood that review courts would be loath to intervene in setting aside decisions based on ... those policies. Policy creates an implementation "layer" at the interface between a statute and the achievement of its objectives. (2010: 5)

In recent years a number of policies dealing with the environment and sustainability have been produced in South Africa. Unlike the case with legislation, on the level of policy distinctions have been made between those policies that deal with the environment and those that deal with sustainable development. Sustainable development policy will then, in turn, be discussed in a later sub-section (see §8.6).

The NEMA principles have been mentioned and discussed, and it is perhaps a credit to the wide ambit of these principles that most of the current environmental policies of the Department of Environmental Affairs are not statements of broad intent but rather of a quite specific nature.

For example consider the following list:

- Bioprospecting Access and Benefit-sharing (BABS)
- Human Capital Development Strategy Environmental Sector
- National Environmental Impact Assessment and Management Strategy
- National Protected Areas Expansion Strategy
- National Waste Management Strategy
- Integrated Environmental Management Information Series
- Biodiversity Management Plan.<sup>279</sup>

These more narrowly focussed plans are not of direct relevance to this study, and thus will not be discussed any further. However one other official document that does merit further discussion is that entitled, *Environmental Sustainability Indicators* (South Africa, 2009a) (ESI2009).<sup>280</sup> Based on international sources and various consultations, this report described 20 indicators selected to monitor environmental sustainability in South Africa.

The purpose of these indicators is to provide information on our ability to protect our environment over the next decades. In addition, the indicators reflect key factors determining the state of the environment, and show whether we are moving towards environmental sustainability or not. (South Africa, 2009a)

The indicators from ESI2009 are reproduced in Appendix G. A significant point of note with regards to this document is reflected in its title, which refers to *environmental* sustainability indicators. This tells one that these indicators are focussed on the natural environment, and by implication that these indicators are therefore not sufficiently broad ranging to be considered as *sustainability* indicators or sustainable development indicators. A quick overview of the indicators listed in ESI2009 will confirm that they are indeed aimed at the natural environment, and when social aspects are touched on, these are usually in respect of issues on the interface between the natural environment and society. But other important issues from the social and

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<sup>279</sup> Available from [https://www.environment.gov.za/?q=content/documents/strategic\\_documents](https://www.environment.gov.za/?q=content/documents/strategic_documents). [Accessed on 30 April 2013]

<sup>280</sup> While a later edition of this document appeared in 2011, the essential information as discussed here has not changed.

economic domains that are needed for sustainability assessments are not included; issues such as poverty, equity, employment and economic performance. This bias towards the natural environment is not entirely surprising given that, in general, environmental law and policy is aimed at the natural environment, and furthermore that this document emanates from the DEA, a department charged with overseeing the natural environment. The problem that this bias holds for sustainable development is discussed more fully in a following sub-section.

Notwithstanding this one-sided emphasis of ESI2009, it can still be a source of verification for at least the environmental measurement themes included in the PSDF. In fact the indicator set of ESI2009 was used as a secondary source in compiling the suite of (environmental) indicator themes included in the PSDF. Its contribution is as follows: the *air pollution* indicator of ESI2009 is not specifically mentioned in the PSDF, but one may safely assume that it is included in the *air quality* theme of the PSDF. However the ESI2009 *groundwater* indicator has actually been added to the PSDF. The *private sector responsiveness* indicator of ESI2009 is another element that has advantageously been added as an explicit indicator theme of the PSDF, as it will reinforce the corporate responsibility principle of the PSDF. With these additions the indicator themes of the PSDF can be said to meet the official SA requirements in respect of environmental sustainability indicators.

#### **8.4.4 Concluding remarks on environmental law and policy in SA**

Given the abundance of environmental policies and laws in SA, one must question their effectiveness in the light of the continued manifestation of many environmental problems. Lumby (2010, 75-78) lists three factors that contribute to weak practical outcomes flowing from the SA environmental legislation. The first of these has to do with the nature of the law itself. With SA law being based on the Roman Dutch legal heritage with its traditional weakness on public law, it means that environmental matters have to deal with through the more labourious route of statute law. Such statute law can, for example, be vague and ambiguous around legal expressions such the 'minister's discretion'. This implies that statute law must be very meticulous and thorough, and areas of possible ambiguity need to be foreseen and then explicitly dealt with in the legislation, making this type of law rather unwieldy. The second problem exists in the many diverse pieces of legislation that have environmental implications,

and then this cumbersome situation is further exacerbated when the bits of environmental legislation are administered by a number of different government departments, as is not infrequently the case. Not only can these scattered pieces of legislation be contradictory, but the administering departments can also have differing perspectives towards the environment. The third problem deals with the inadequate enforcement of the legislation. This arises from a lack of human resources and expertise in governance structures. A manifestation of this problem, which is of particular relevance to civil engineers, is the long time taken to adjudicate on EIAs. As a consequence of this slow rate in producing environmental authorisations, development projects may be delayed for many months.

However it is considered that environmental jurisprudence, as has it been practised in South Africa over the last few years has, for various reasons, including *inter alia*, court judgements, the frequency of litigation and the positive approach to legal standing, led to refinements that have benefited the environmental cause. In Smith's view

the foundations laid by developments in our environmental jurisprudence in the past decade provide a vibrant and fertile ground for this country's judiciary to take a lead in achieving sustainable development in South Africa, and beyond our borders. (2010: 10)

And so it is to the more particular relationship between *sustainable development* and environmental law that attention is turned in the next sub-section.

## 8.5 SUSTAINABLE DEVELOPMENT AND SA ENVIRONMENTAL LAW

The SA Constitution promotes "ecologically sustainable development and use of natural resources while promoting justifiable economic and social development" (South Africa, 1996: S24). From this one may conclude that the Constitution supports, even if somewhat unusually articulated, the three dimensional model of sustainable development. NEMA (South Africa, 1998) is more direct; it simply states, in Section 2(3), that "[d]evelopment must be socially, environmentally and economically sustainable". However it does also provide a formal definition of sustainable development. According to NEMA it

means the integration of social, economic and environmental factors into planning, implementation and decisionmaking so as to ensure that development serves present

and future generations. (South Africa, 1998:S1)

Furthermore in Section 2(4)(a) NEMA elaborates in no less than eight points, on what sustainable development entails. (See §4 in Appendix C10.) Clearly then, both the Constitution and NEMA subscribe to the notion of sustainable development which, at least in South African terms, not only ascribes a high legal status to the concept, but also implies that other South African legislation cannot be contradictory to it.

However, notwithstanding this strong legal position occupied by sustainable development, from another angle its status and efficacy may be somewhat undermined by the fact that while environmental law is most often the home of sustainable development legislation,<sup>281</sup> it is characteristic of this branch of the law to be biased towards the natural environment. Furthermore as the Department of Environmental Affairs is the home of environmental law in South Africa, it by implication becomes the official custodian of sustainable development in this country.<sup>282</sup> The point being made here is that sustainable development, with its broad sweep over the natural, social and economic environments, might be confined by the type of legislation it finds expression in, and by its home in the governmental structures, to a field of application where the focus is primarily on the natural environment. In a world without historical precedents one might opt for an arrangement where a government department of sustainable development affairs is senior to the departments of economic, environmental and social affairs. And if sustainable development is to fulfil the role as the practical expression of a new world-view, it is not illogical that all other departments such as agriculture, water affairs, energy, mining, health, justice defence, police, etc., should have a more junior status compared to the department of sustainable development. This imaginary arrangement might not seem so fanciful if one viewed this against a global problem such as climate change, the consequences of which could impact radically on the sphere of operations of all the departments mentioned above. In practical terms it might even be better for such a 'department of sustainable development' to be outside of government, in the form of an independent agency, where political power and intra-governmental forces play a lesser role.<sup>283</sup> But it is not within the scope of this study to venture into such speculative proposals, so it is perhaps more appropriate to look at a practical instance where the control that is vested in the Department of

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<sup>281</sup> One could, for example, argue that in South Africa NEMA is the parent legislation of sustainable development.

<sup>282</sup> This is evidenced by policies, such as NFSD and NSSD, that emanate from the Department.

<sup>283</sup> One may here be reminded of the role that the Public Protector plays in South Africa.

Environmental Affairs could be seen as less than optimal in terms of sustainable development. As an example of such an instance, take the role played by the authorities in the EIA process.

The EIA process is covered in NEMA Chapter 5, under the heading *Integrated Environmental Management* (IEM). Clause 23(2) describes the objectives of IEM, *inter alia*, as the promotion of “the integration of the principles of environmental management set out in section 2”,<sup>284</sup> and to “identify, predict and evaluate the actual and potential impact [of activities] on the environment, socio-economic conditions and cultural heritage” (South Africa, 1998). Thus there is little doubt that the EIA process, as officially envisaged in South Africa, is intended to promote sustainable development not only nominally, but also the full, multi-dimensional interpretation of the concept. Yet, in practice, it is the national or provincial departments of *environmental* affairs who are cast in the role of ‘competent authorities’, and are charged with the task of adjudicating EIAs, and issuing environmental authorisations; this, notwithstanding their narrower focus on the natural environment. It stands to reason that a department, the functional expertise of which is effectively mostly in the area of the natural sciences, must be at some disadvantage in adjudicating on issues in the broader socio-economic arena. It is true that NEMA does allow for the appointment of external specialist reviewers (S24I), but it is not clear to what extent this provision is carried out in practice, and in the event of this route being followed, it is not unlikely that further delays would be incurred. An alternative, and possibly more efficient mode of operation, would be (as has been suggested) the establishment of an independent environmental agency, which should have not only a broad mandate, but also the in-house expertise, and the authority to carry out this mandate. Apart from the practical issues, it can be seen that such an arrangement would mirror the overarching ambit of sustainable development more closely, and it would allow a broad implementation of the concept, without the inevitable restrictions that would result as a consequence of it being homed in a one-dimensional, relatively low-powered, government department. Having indicated that it is not the intention here to indulge in fanciful thinking, it remains just to suggest, while remaining within the bounds of reality, that sustainable development might be better accommodated within the mandate of the National Planning Commission,<sup>285</sup> from which position

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<sup>284</sup> Effectively these principles can be seen as sustainable development principles, as was assumed in Chapter 5, and as they are listed in Appendix C10.

<sup>285</sup> This Commission operates under the auspices of the Presidency, and as such occupies a position of high authority.

it may gain the authority and scope appropriate to the concept.<sup>286</sup>

But this problem of an appropriate home for sustainable development in legislative arrangements is not unique to South Africa. The interpretation of environmental law in South Africa follows the international trend. The major environmental laws of many countries<sup>287</sup> are in fact just that – environmental laws, and not laws specifically aimed at sustainable development. In Australia, Canada and the UK the environmental laws are framed as ‘environmental protection’ acts, in the USA as an ‘environmental policy’ act, in New Zealand as a ‘resource management’ act, and in South Africa of course, originally as an ‘environmental conservation’ act, and latterly as an ‘environmental management’ act.<sup>288</sup> One may thus conclude that environmental law internationally leans towards the natural environment, and that *sustainable development*, despite its wide popularity, as is evidenced in many national sustainable development ‘policies’,<sup>289</sup> still occupies a somewhat ambiguous position in environmental law. The argument that the focus of environmental law should be on the natural environment, because if this was not the case, then all law would simply become environmental law, does not hold water when it comes to sustainable development. Indeed one could argue, given the multi-dimensional nature of sustainable development and its holistic attribute, that all law should, in fact, be sustainable development law, or framed differently, uphold the principles of sustainable development. Again this represents an idealistic position, and for the present, it may simply have to be accepted that sustainable development, when promoted under the auspices of environmental law, is different to the other components of environmental law. Indeed as a matter of principle, it should be acknowledged that its scope exceeds the general ambit of environmental law, and that it should be

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<sup>286</sup> It will be suggested later in this study the National Development Plan issued by the National Planning Commission, should have been the National Sustainable Development Plan.

<sup>287</sup> While it might be debatable to frame the laws being referred to as ‘major’ laws, the point made here still remains valid.

<sup>288</sup> The *Environment Protection and Biodiversity Conservation Act 1999* of Australia.  
The *Canadian Environmental Protection Act of 1999*.  
The *Environmental Protection Act 1990* of the UK.  
The *National Environmental Policy Act 1969* of the USA.  
The *Resource Management Act 1991* of New Zealand.  
The *Environment Conservation Act 1989* of South Africa  
The *National Environmental Management Act 1998* of South Africa.

<sup>289</sup> For example, the Irish *Principles for Sustainable Development* (Comhar, undated), the *Australian National Strategy for Ecologically Sustainable Development* (Australia, 1992), the British *Securing the Future* (Defra, 2005), the American *New Sustainable Frontier* (Herz, *et al.*, 2009), the *Sustainable Development for New Zealand Programme of Action* (New Zealand, 2003) and the *National Framework for Sustainable Development in South Africa* (South Africa, 2008).

treated as an exception in legislative arrangements.

Returning to the South African scene it is comforting to see that recent court decisions reflect the judiciary's awareness of both the constitutional prescription of sustainable development, and the broader meaning that is attached to the concept. Murombo, in referring to a case heard by the Constitutional Court, highlights that the verdict in this case is

the first decision by the Constitutional Court to affirm that the notion of sustainable development underpins the environmental rights enshrined in s 24 of the Constitution. (2008: 503)

And in a second case before the Constitutional Court, Murombo asserts that the court's decision is further confirmation of the court's determination to ensure that the right to an environment not harmful to health and well-being is safeguarded through the promotion of the concept of sustainable development. (2008: 504)

But the Constitutional Court judgements are also "significant for defining the scope of sustainable development ... despite the absence of shared legal content at the international level" (Murombo, 2008: 503). In this regard a relevant extract from the court judgement in the first case reads as follows:

[Sustainable development] offers an important principle for the resolution of tensions between the need to protect the environment on the one hand, and the need for socio-economic development on the other hand. In this sense, the concept of sustainable development provides a framework for reconciling socio-economic development and environmental protection. (Constitutional Court, 2007: §57)

And also:

Economic and social development is essential to the well-being of human beings. ... But development cannot subsist upon a deteriorating environmental base. Unlimited development is detrimental to the environment and the destruction of the environment is detrimental to development. Promotion of development requires the protection of the environment. Yet the environment cannot be protected if development does not pay attention to the costs of environmental destruction. The environment and development are thus inexorably linked. (Constitutional Court, 2007: §44)

It is of interest to note that the extracts above do not only endorse the multi-dimensional nature of sustainable development, but also seem to recognise the hierarchy within these dimensions. And so, despite misgivings expressed here above around the status of sustainable development in SA law, and a proper institutional home for it, the concept does appear to enjoy, either by way of statute law or by way of judicial precedent, sufficient legal backing to suggest that it should be a vital element of official policy.

## 8.6 SUSTAINABLE DEVELOPMENT POLICY IN SOUTH AFRICA

Since the World Summit for Sustainable Development was held in Johannesburg in 2002 the South African policy framework with respect to sustainable development has evolved through several phases. The first phase (2003-2008) culminated in the adoption in 2008 of the *National Framework for Sustainable Development* (NFSD) by the SA Cabinet. This document spells out, after reviewing the environmental, social and economic trends in the country up to that point in time, the vision, goals and strategic priorities for sustainable development in South Africa. The next phase (2009-2011) involved the formulation of a strategy and action plan for the third phase (2011-2014). The second phase concluded in November 2011, when the Cabinet approved the *National Strategy for Sustainable Development and Action Plan* (NSSD1), which was based on the NFSD, and which also included suggested institutional arrangements for the management of the plan. Lessons learnt out of the implementation of this plan will inform the following phase (NSSD2 for 2015-2020) (South Africa, 2011).

These two documents, the *National Framework for Sustainable Development* (NFSD) and the *National Strategy for Sustainable Development and Action Plan* (NSSD1), will form, in the main, the basis of the discussion in this sub-section. The objective will be to see to what extent these documents corroborate or add to the understanding of sustainable development as it has evolved in this study, and as it has been captured in the proposed sustainable development framework (PSDF) outlined in Appendix F.

With the NFSD being described as a *framework for sustainable development* and the NSSD1 as an *a strategy and action plan* flowing out of the NFSD, one would expect the NSSD1 to be lean on theory and more focussed on the details of the proposed actions based on the pre-established framework. While the intention for the NSSD1 to be based on the NFSD is clearly stated, it appears that the NSSD1 does renegotiate some of the ground of the NFSD, as if the compilers of the NSSD1 had had a rethink on some of the basic issues. The NFSD, after a promising start, seems to shy away from the hard choices that the path of sustainable development may require. The NSSD1, on the other hand, assessed in overview, seems more bold in its general aspirations. (This is not say that its content, structure and

ultimate authority are above question.) While in the discussions to follow, reference will be made to both documents, the NSSD1 may, in the light of the above comments, and the fact that it is a later document, be given, where appropriate, more weight than the NFSD.

It needs to be noted at the outset that despite the similarity in the naming of the NFSD and the PSDF, there are significant differences in their rationales. While the NFSD, and for that matter the NSSD1, set out to be *national* programmes and hence are framed within the conditions and priorities pertaining to South Africa, the PSDF has a more general intention, and its focus is on the nature and “essence” of sustainable development *per se*, with little heed given to a particular context. With South Africa being a developing country, having emerged relatively recently from an oppressive regime, one would expect the legacy of this period to have some influence on its perception of sustainable development. With the NFSD and the NSSD1 being developed by a government department and finally approved by the Cabinet it would be surprising if they did not conform to the political affinities of the ruling party.<sup>290</sup> If this is perceived as a constraint, the PSDF will, on the other hand, being derived as it is from multiple international sources, have a more open perspective. Because of its drive towards being a general instrument, one would expect the PSDF to cover at least all the aspects covered in the NFSD, the NSSD1 and possibly more. Where there are non-conformities, one would hope that these would be due to context rather than principle. Having said that, it is evident when comparing the basic elements of the PSDF with those of the NFSD and the NSSD1 that a significant level of correlation is mostly apparent. It is then the basic elements of sustainable development, as they are expressed in these various document, that will be focus of the next sub-section.

### 8.6.1 Sustainable development basics in the NFSD, the NSSD1 and the PSDF

The basic elements of sustainable development are summed up in the NSSD1 as follows:

***Sustainability*** (or a sustainable society) is seen as the overall goal of the NSSD 1. Sustainability in this context implies ***ecological sustainability***. In the first instance, it recognises that the maintenance of healthy ecosystems and natural resources are preconditions for human wellbeing. In the second instance, it recognises that there are limits to the goods and services that can be provided. In other words, ecological sustainability acknowledges that human beings are part of nature and not a separate entity.

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<sup>290</sup> While this is not to say that the NFSD and the NSSD1 have not been through open participation processes, one still finds reference in them to issues particular to the South African context, such as black economic empowerment, for example.

***Sustainable development*** is the process that is followed to achieve the goal of sustainability. Sustainable development implies the selection and implementation of a development option, which allows for appropriate and justifiable social and economic goals to be achieved, based on the meeting of basic needs and equity, without compromising the natural system on which it is based. (South Africa, 2011: 8)

The PSDF shares this basic understanding of sustainable development as it is conveyed in the above extract. The main elements of this understanding are the following:

- the vision of sustainable development
- the dimensions of sustainable development
- the hierarchy between the dimensions of sustainable development.

Both the NSSD1 and the PSDF choose as their point of departure, the ideal of a sustainable society; the NSSD1 (in the extract here above) calls it an overall goal, while the PSDF refers to it as a vision. The NFSD is also forthcoming in this regard. It speaks of a “national vision for sustainable development [which] is informed by the environmental and other fundamental human rights enshrined in Constitution”, and then defines it as follows:

South Africa aspires to be a sustainable, economically prosperous and self-reliant nation state that safeguards its democracy by meeting the fundamental human needs of its people, by managing its limited ecological resources responsibly for current and future generations, and by advancing efficient and effective integrated planning and governance through national, regional and global collaboration. (South Africa, 2008: 19)

While the NFSD understandably makes its vision subject to the South African Constitution, a purist may argue that a vision should precede a constitution; a pragmatist might simply want to focus on the content of the vision itself. The vision of the NFSD, as articulated here above, is endorsed by the NSSD1 (2011: 9), and on face value it appears to be far more comprehensive than that of the PSDF.<sup>291</sup> However it could be argued that the PSDF definition is general enough to cover, in its generality, all aspects of the NFSD/NSSD1 formulation. Furthermore it should also be remembered that the PSDF includes, in support of its vision, a range of principles that deal with all the aspects mentioned in the NFSD/NSSD1 definition: democracy, human needs, limited natural resources, future generations, efficiency, integrated planning and collaboration

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<sup>291</sup> In the PSDF (Appendix F) a sustainable society is defined as one that maximises the well-being of its members while they live in harmony with their environment.

right up to the global level. It is contended here that the structured layout of the PSDF is better at conveying the intention of each of these aspects than the condensed formulation of the NFSD.

The second basic element of sustainable development that is common to the NSSD1 and the PSDF is the dimensional conceptualisation of sustainable development. This is not surprising as most conceptualisations of sustainable development follow the traditional breakdown into the dimensions of environmental, social and economic sustainability. The NFSD, and by implication the NSSD1 (being based on the NFSD), endorse the dimensionally oriented definition of sustainable development provided by NEMA:

Sustainable development means the integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations. (South Africa, 2008: 14)

But then both the NSSD1 and the NFSD explicitly advocate a

... systems approach to sustainability ... [where] the economic system, socio-political system and ecosystem are seen as embedded within each other, and then integrated via the governance system that holds all the other systems together within a legitimate regulatory framework. Sustainability implies the continuous and mutually compatible integration of these systems over time. (South Africa, 2011: 1)

Inherent in these definitions then are the PSDF principles of holism and sustainability. (See Appendix C16 for a formulation of these principles.) The principle of sustainability is built around the dimensional conceptualisation of sustainable development and the holism principle prescribes the need for integration between these dimensions. It is evident from the above that the NSSD1 subscribes to a four-dimensional model of sustainable development, and this correlates exactly with the dimensional arrangement as adopted in the PSDF. The NSSD1 describes the fourth dimension as “a legitimate regulatory framework”, in short that of *governance*, and it corresponds to the institutional dimension of the PSDF.

The third important element of correlation between the NSSD1 and the PSDF is the hierarchy ascribed to the dimensions of sustainable development. The NSSD1 speaks of “healthy ecosystems and natural resources ... [as] *preconditions* [emphasis added] ... for appropriate and justifiable social and economic goals to be achieved” (South Africa, 2011: 8).

Diagrammatically this four-dimensional model of sustainable development, and the hierarchy contained within it, is represented by the NSSD1 as shown in Figure 8.1. This can be taken as an advance on the nested three dimensional representation depicted in Figure 7.1 in that it not only adds the fourth dimension, but then also depicts it as the support base for the other dimensions.

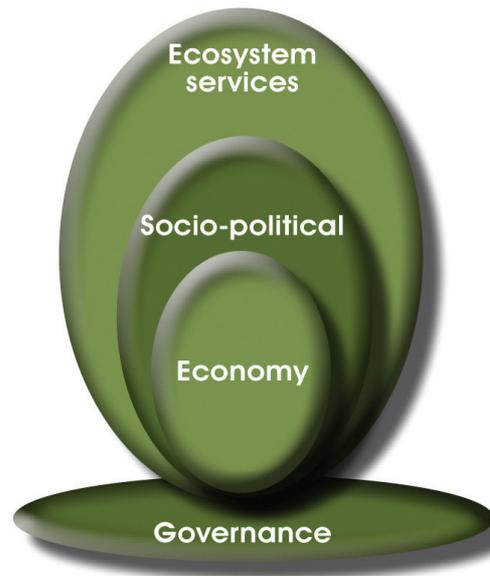


FIGURE 8.1: A FOUR-DIMENSIONAL MODEL OF SUSTAINABLE DEVELOPMENT  
(South Africa, 2011: 1)

Aside from this depiction (Figure 8.1) of the four-dimensional model of sustainable development the NFSD confirms verbally that the “social, economic and ecosystem factors are embedded within each other, and are underpinned by our systems of governance”. Furthermore it endorses the understanding “that there are non-negotiable ecological thresholds”, and that to live sustainably “we need to maintain our stock of natural capital over time” (South Africa, 2008: 14).

Similar to the PSDF the NSSD1 is also based on an hierarchy of descriptors that are used as an index column in a tabular layout. However with the NSSD1 being a strategy and action plan rather than a ‘blueprint’ for sustainable development, as the PSDF purports to be, there are, understandably, differences. A comparison between the two sets of descriptors is shown in Table 8.2

TABLE 8.2: SUSTAINABLE DEVELOPMENT DESCRIPTORS

<b>NSSD1</b> (South Africa, 2011: 7)	<b>PSDF</b> (Appendix F)
Vision	Vision
Goals	Values
Strategic Priorities	Foundational Principles
Objectives	Dimensions
Interventions	Goals
Headline Indicators	Subsidiary Principles
Institutional	Measurement Themes
Evaluation and Feedback	Applications

One would expect the NSSD1, being a strategy/action plan to be more focussed on action than the PSDF; and with descriptors such as “interventions” and “evaluation and feedback” this is certainly the case. But, on the other hand, one would assume that at the top levels there should be a greater degree of correspondence between the PSDF and the NSSD1. Indeed the descriptor hierarchies in both instruments start off with “vision” as the first descriptor, but then the NSSD1 has no place for “values” and “principles”, the latter omission being rather surprising as the NSSD1 does elsewhere list the principles to which it subscribes. In the NSSD1 hierarchy of descriptors “strategic priorities” are followed “goals”, but there is no indication of how these are linked – in other words, the goals do not attach to any particular strategic priority. Elsewhere in the NSSD1 three “key elements have been identified” that are needed “to ensure that a shift takes place towards a more sustainable development path” (South Africa, 2011: 9). But these elements too do not find their way into the tabular presentation of the NSSD1. Thus, on face value, the structure of the NSSD1 does not appear as tight and logical as it could be. Bearing in mind the different objectives of the NSSD1 and the PSDF, it certainly can be argued that at the higher, more foundational levels, the PSDF does present a more tightly structured and convincing description of sustainable development.

Having touched on the issue of principles, it is now appropriate to turn to a comparison between

the sustainable development principles contained in the NSSD1<sup>292</sup> and those in the PSDF. The NSSD1 principles are grouped into three categories, these being the categories of “fundamental”, “substantive” and “process” principles (South Africa, 2011: 9). The fundamental principles arise from the “fundamental human rights that are guaranteed in the Constitution, and [that] underpin the very nature of our society and system of governance”. The substantive principles are described as the “conditions that *must* [emphasis added] be met in order to have a sustainable society. These principles ... are already enshrined in South African law”. The process principles apply to the operationalisation of the NFSD and the NSSD1 (South Africa, 2008: 20).

While the hierarchical structure of the NSSD1 principles is similar to the levels of principles (foundational and subsidiary) as set out in the PSDF (see Appendix C16), there could be some debate about what the NSSD1 calls fundamental principles. Being, as it is, a government policy one can understand the premium that the NSSD1 places upon the Constitution, but the “fundamental” principles it derives from the Constitution are principles that aim at desirable social conditions,<sup>293</sup> and hence, as far as the PSDF is concerned, would mostly be categorised as subsidiary principles that belong in the social dimension of sustainable development. It could be argued that the so-called “substantive” principles of the NSSD1 are more fundamental than those that go by that appellation in the NSSD1, as they, the “substantive” principles, “*must* be met in order to have a sustainable society”. An exception might be the *justice and fairness* principle (see here below) which, in a fundamental form, may relate to the PSDF’s basic value of fairness. It must be said though that the fairness value of the PSDF is not fundamentally an anthropocentric value, and that as such it is probably far wider than what the NSSD1 intends it to be.

The NSSD1 principles are listed here below, and after each, in brackets, the number of the PSDF principle(s) (see Appendix C16) that correspond most closely to the NSSD1 principle

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<sup>292</sup> The NSSD1 calls them the principles that underpin the vision of a sustainable society.

<sup>293</sup> This is not surprising given the heavy human rights orientation of the Constitution. The rationale of the PSDF suggests that instead of having a Bill of Human Rights in the Constitution, it should rather have a Bill of Environmental Rights (the environment being broadly interpreted as suggested in Chapter 1 of this study). In other words it is the principles of sustainable development that should inform the constitution, and not the other way around.

in question, is given:

The fundamental principles are:

- human dignity and social equity (§3.1 & §3.2)
- justice and fairness (§3.1)
- democratic governance. (§5.1)
- a healthy and safe environment (§3.1 & §3.2).

The substantive principles are:

- sustainable use of natural resources (§2.1 & §4.1)
- socio-economic systems are embedded within, and dependant upon, eco-systems (§1.3)
- basic human needs must be met to ensure resources necessary for long-term survival are not destroyed for short term gain. (§1.2 & §3.2).

The process principles are:

- integration and innovation (§5.2)
- consultation and participation (§3.3 & §5.2)
- implementation in a phased manner.

The NSSD1 principles do not have the benefit of being further elaborated on, after they are introduced in the NSSD1, and hence their full intention and scope, may not always be evident. Nevertheless it appears that they are all adequately covered by the principles of the PSDF, with the exception of only the last one in the list above. This principle suggests a phased implementation of sustainable development actions, and as such is perhaps more of a strategy with specific reference to the approach being proposed for South Africa, rather than a general principle of sustainable development *per se*. In this light it does not warrant inclusion as a general principle of sustainable development in the PSDF.

It might be of concern that some important principles listed in the PSDF are not directly mentioned in the NSSD1. (For example, one might point to the principles of holism, the precautionary principle, the efficiency principle, etc.) As a defence it may be argued that as the NSSD1 is located within, and is supported by an existing legal/administrative system, in which

certain articles of principle have already been stated (such as those in the Constitution and in NEMA), the need for comprehensiveness, as far as the NSSD1 is concerned, is reduced. Indeed the NFSD (out of which the NSSD1 flows) pointedly avoids being a “master plan”, but rather endorses the “need to build on existing programmes and strategies” (South Africa, 2008: 16). But, on the other hand, if the view that sustainable development should represent a paradigm shift is to be taken seriously, it predicates that a national policy statement on sustainable development should, rather than seek to build on other policies, be a primary statement that drives other policies and laws. Here the NSSD1 seems maybe uncertain of its role; on the one hand it seeks “the effective integration of sustainability concerns into all policies, planning and decision-making at national, provincial and local levels” (South Africa, 2011: 7), but then on the other hand it defers to “existing programmes and strategies” (e.g. NEMA). If the NSSD1 is only a strategy and action plan, then its more lowly role may be understood, but clearly it also attempts to justify, in the form of higher level statements on sustainable development, its *raison d’être*. While, for the moment, the more ‘practical’ aspects of the NSSD1 as an action plan is left in abeyance, the next sub-section will focus more closely on its ‘theoretical’ aspects.

### **8.6.2 A critical look at the “essence” of the NSSD1 and its relationships to other policies**

The issue of anthropocentric bias is germane to the discourse around sustainable development, and hence the NSSD1 may also be investigated in this regard. There is evidence of anthropocentrism in some of the source documents of the NSSD1; the anthropocentric leanings of the Constitution and NEMA have already been referred to. However, given the political priorities of a country trying to recover from a history of unfair discrimination, and the prevailing large socio-economic disparities, such a bias towards the social issues may be understandable. In this regard the NFSD (another source document of the NSSD1) argues as follows:

It is a projection of our nation’s aspirations of achieving a better quality of life for all now and in future, through equitable access to resources and shared prosperity. (South Africa, 2008: 8)

As a result, the NFSD concludes that material growth is necessary. It argues that

... poverty eradication will of necessity entail substantial investments in material infrastructure, physical development and the material pre-conditions for a decent quality of life for all ... [notwithstanding that] ... the acceleration of material

economic growth will hit increasingly costly resource constraints resulting in *unsustainable development*. (South Africa, 2008: 15, 13)

Turning to the NSSD1 itself, its vision and principles, which have already been quoted, focus on the welfare of South African society; consideration for the environment, such as there may be, arises, in the main, from the contribution that the natural environment can make towards the welfare of society. Furthermore, a scrutiny of the NSSD1 principles (listed in full here above), reveals that none of the fundamental and process principles directly address the natural environment,<sup>294</sup> and of the substantive principles two do so,<sup>295</sup> but without, it seems necessarily placing any inherent value on nature. One simply sees nature as a resource, and the other, while proclaiming socio-economic systems to be dependent on ecosystems, does so from the viewpoint of human benefit. It seems that one can safely conclude that in the NSSD1 the environment enjoys instrumental value rather than intrinsic value. The omission of the respect for (all) life principle from the NSSD1 (and the NFSD for that matter) would support this conclusion. One could thus, with some justification, expect the NSSD1 to lean more towards weak sustainability on the weak/strong sustainability spectrum.

In defence of the NSSD1 it is probably true to say that it would be hard to find any general government policy, from any country, that does not explicitly, or by implication aim, in the first instance, at enhancing the welfare of the citizens of that country. It is also true that the NSSD1 specifically disavows “the perspective that human beings are separate from, and superior to, nature” (South Africa, 2011: 13). Given too that there must be some subjectivity in the above assessments, it is probably more productive to play down whatever anthropocentric leaning there may be in the NSSD1, and instead to rather focus, with the pragmatists, on what the positive outcomes of this policy statement could be.

While it is not within the scope of this study to investigate the detail of sustainability action plans – these could obviously vary widely depending upon prevailing conditions – it is the rationale of such action plans that would be of interest. Turning to an analysis, in the NFSD,

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<sup>294</sup> The reference to a “healthy and safe environment” is, one would presume from its sourcing in the SA Constitution, articulated from, a human perspective.

<sup>295</sup> They are the principle of the ‘sustainable use of natural resources’ and the principle that ‘socio-economic systems are embedded within, and dependant upon, eco-systems’.

of the trends in the natural, social, economic, governance and international environments, and of the progress that has already been made in response to the challenges posed by these trends, the NFSD concluded that the gaps and shortcomings that still remain, could be addressed through “five critical ‘pathways’ ... [which] constitute the strategic focus areas for action and interventions that are necessary to reach the desired ideal state of sustainable development described in the national vision” (South Africa, 2008: 32-33). (Limiting the area of investigation, in this case to five “pathways”, is in line with Bellagio principle no. 5. – see §7.2.2.) These five critical pathways or strategic focus areas are endorsed (with some minor amendments) in the NSSD1 as strategic priorities. See Table 8.3.

TABLE 8.3: STRATEGIC ACTION COMPARISON – NFSD vs NSSD1  
(South Africa, 2011: 14)

<b>NFSD STRATEGIC FOCUS AREAS</b>	<b>NSSD1 STRATEGIC PRIORITIES</b>
1. Enhancing systems for integrated planning and implementation	1. Enhancing systems for integrated planning and implementation
2. Sustaining our ecosystems and using natural resources efficiently	2. Sustaining our ecosystems and using natural resources efficiently
3. Economic development via investing in sustainable infrastructure	3. Towards a green economy
4. Creating sustainable human settlements	4. Building sustainable communities
5. Responding to emerging social, economic and environmental challenges	5. Responding effectively to climate change

It is interesting to note that of the five strategic priorities, there is one for each of the dimensions of sustainable development (broadly speaking and in order, the institutional, environmental, economic and social dimensions) plus an additional one that focusses on a pressing problem of the present (climate change) with roots in the environmental dimension but important implications for all the other dimensions. Whether this spread of priorities was intentional or coincidental is not known, but it does reflect some kind of balance, that could possibly be interpreted as a counter to the anthropocentric bias previously referred to.

Another point of interest is the comparison between the hierarchical structures of these policy instruments, particularly if the draft of the NSSD1 (the *National Strategy and Action Plan for Sustainable Development*, published in 2010 for comment, and here abbreviated as the NSSD

(South Africa, 2010)) is included. They all include a vision and a set of principles which content wise is the same for all three. The NFSD then proceeds to *strategic focus areas* followed by *interventions and actions*. The NSSD makes a clear distinction between strategy and action plan; under strategy it has *strategic elements and strategic goals*, and under action plan it has *strategic priorities and goals*. The NSSD1 starts with a set of (strategic?) *goals*, followed by *strategic priorities, objectives* and (more?) *goals*. A more detailed breakdown of the NFSD, the NSSD and the NSSD1, in terms of the said descriptors is given in Appendix H1. As the NFSD is the forerunner of the other two documents, and given that ideas evolve, it need not be considered too closely here but between the NSSD and the NSSD1 there seems to be a regression, almost. The clear distinction between strategy and action plan, and the articulation of strategic goals seem to have been lost in the progression from the NSSD to the NSSD1. True, the (strategic) elements of the NSSD are discussed in the NSSD1, but then separately and not directly connected to the strategy and action plan, in which they are replaced, it seems, by a set of goals, that receive very little further elaboration, and are not connected to the strategic priorities that follow. It is here considered that the strategic elements (and goals) of the NSSD make a stronger statement than the strategic goals (and objectives) of the NSSD1, particularly with regards to potential anthropocentric bias, and as such bear repeating here (see Box 8.1).

### SUSTAINABLE DEVELOPMENT STRATEGIES AND GOALS

**Directing the development path towards sustainability:**

- Reduce resource use as well as the carbon intensity of the economy
- Provide equal access to resources and a decent quality of life for all citizens
- Effective integration of sustainability concerns into policies, planning and decision-making at all levels.

**Changing behaviour, values and attitudes:**

- Develop and promote new social and economic goals based on sustainability
- Promote environmentally responsible behaviour through incentives and disincentives
- Build a recognition that socio-economic systems are dependent on and embedded within ecosystems
- Increase understanding of the value of natural resources (ecosystem services) to human wellbeing.

**Restructuring the governance system and building capacity:**

- Ensure effective integration and collaboration across all functions and sectors within government
- Demonstrate commitment in changing the development focus to one based on sustainable programmes
- Adopt a long-term view to development planning that considers inter-generational equity
- Adhere to and exercise principles of good and ethical governance
- Monitor, evaluate and report performance and progress in respect of sustainability goals.

#### BOX 8.1: THE SUSTAINABLE DEVELOPMENT STRATEGY OF THE NSSD (From South Africa, 2010: 12-15)

The strategies of the NSSD,

- directing the development path towards sustainability,
- changing behaviour, values and attitudes, and
- restructuring the governance system and building capacity

are considered particularly strong sustainability statements; some of them may be said to hint at the idea of a new world-view. Hence it is their omission from the NSSD1 that prompted the assessment that there might be some regression from the NSSD to the NSSD1. It needs to be added though, on the positive side, that NSSD1 does expand on its strategic priorities by adding, to each, a number of headline indicators with specific targets – the action plan component of the NSSD1. (See Appendix H2.) While this approach is commendable it remains to be seen to what extent these targets are met in practice.

While the NSSD1 was the outcome of specialist consultation and broader participation, this policy statement still remains the product of a government initiative, and hence it airs only

mutated criticism of government performance to date, and the strategic priorities avoid politically sensitive issues. For example, demographics, crime and corruption, all very pertinent to sustainable development in general, but particularly pertinent to South Africa, do not feature as priorities for the NSSD1, nor are they explicitly counted under the headline indicators for these priorities (see Appendix H2). The lack of basic service delivery, currently a major problem in South Africa, is also not explicitly mentioned as a priority, but some of the headline indicators under priority 4 of the NSSD1 do address service delivery issues (see Appendix H2). Other issues which come to mind as being critical in South Africa, are for example HIV/AIDS and the poaching of rhino and abalone. However as has been intimated earlier, it is not an objective of this study to become involved in discussions around the action plans, and so the focus now turns to the status of the NSSD1 in relation to other government policies not yet mentioned.

Prior to the appearance of the NSSD1 existing planning policies included the *Medium Term Strategic Framework for 2009-2014* (MTSF), the *New Growth Path* and the *Industrial Policy Action Plan* (South Africa, 2011: 10). Subsequent to the publication of the NSSD1 the latest, and conceivably the most senior, planning document of the government, the *National Development Plan* (NDP), drawn up by the National Planning Commission (NPC),<sup>296</sup> was issued in 2012 (South Africa, 2012). A general comment that may be apposite here is that the NSSD1 appears to be but one of many planning policies of the government, and apart from meeting a general requirement that such policies should not contradict each other, it seems to enjoy no special status. If this is the case then one could detect a possible misunderstanding here of the holistic nature of sustainable development. The holistic principle requires, in the least, that every governmental policy should incorporate the notion of sustainability as a main point of departure, but this appears not to be the case. Alternatively then, there should be a sustainability policy, and all other policies should subscribe to its prescriptions. In this sense one could assert that there is no higher level strategy for a country than sustainability, and that because of the holistic principle of sustainable development, all other strategies should find accommodation within the broader strategy of sustainability.

The NSSD1 did set the goal to ensure the

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<sup>296</sup> The NPC is located within the Department of the Presidency.

integration of sustainable development into the national vision and strategic planning processes of government. (South Africa, 2011: 17)

But it then expands on this goal in somewhat muted terms. For example it seeks:

*Engagement* with government departments, the Presidency and the NPC to *discuss* the integration of sustainability principles, outcomes, indicators and other NSSD1 proposals into the national vision and strategic plan. (South Africa, 2011: 17; [emphases added])

‘Engagement’ and ‘discussion’ do not quite convey the imperative nature of sustainability. It could even be argued that the *National Development Plan* should have been called the *National Sustainable Development Plan*.<sup>297</sup> As it is the NDP makes no explicit reference to the NSSD1 itself or the NSSD1 priorities, it mentions sustainable development only in passing, and it refers to sustainability mostly in the context of the more limited form of *environmental* sustainability. Admittedly the formulators of the NDP may have felt restricted by its terms of reference as they emerge from its stated aims of eliminating poverty and reducing inequality (South Africa, 2012: 24), which important as they are, are quite limited. Nevertheless the NDP does address a wide range of issues (including some of those that the NSSD1 is silent on or treats in a very low key manner, e.g. crime and HIV/AIDS), and thus, in scope, the NDP addresses many of the issues that would be integral to a sustainable development policy. However by not embracing sustainable development as a foundation stone the NDP loses the benefit of the guidance provided by the sustainable development ethos and principles (see the PSDF in Appendix F). In particular one thinks of a stronger integration between the economic, the social and the environmental dimensions, the inherent hierarchy of these dimensions, and a more forceful commitment to non-anthropocentrism.

Turning to the MTSF, one observes, on the positive side, that it does identify the implementation of the NFSD as one of its priorities, but on the other hand, this being only one of ten priorities, one feels again that this might indicate a misunderstanding of the scope and breadth of sustainable development. While not suggesting that the order of the priorities is necessarily indicative of a ranking order, the implementation of the NFSD does only come in at the ninth position under the appellation of “sustainable resource management and use” (South Africa, 2009b: 5-6; 26-27). Thus again, as is the case with the NDP, sustainability is

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<sup>297</sup> What is implied here is of course much more than merely a change in name.

interpreted within the more narrow confines of the natural environment, and furthermore with an anthropocentric focus on it as the wellspring of natural resources. For noting, the priorities of both the NDP and the MTSF are listed in Appendix H3. In reviewing these lists of priorities, it seem quite evident that virtually all the listed priorities could, their manifest social bias notwithstanding, be considered legitimate sustainable development objectives. The problem however is, that in placing them outside the ambit of sustainable development, they may be pursued in unsustainable ways. Sustainability and the principle of holism requires that *all* development priorities and actions should be subject to the ethos and principles of sustainable development. The NSSD1 does, in some of its pronouncements, seem to accord this primary role to sustainable development, but seen in the context of many other government policies of equal or higher status, this message becomes watered down.

In looking at the institutional options for the implementation of the National Strategy for Sustainable Development and Action Plan, the NSSD (the draft version of the NSSD1) suggested three possible options (South Africa, 2010: 41-43). The boldest of these called for the establishment of a (stand-alone) statutory commission for Sustainable Development (where the allure of independence, such as that ascribed to the judiciary, can be a significant feature).<sup>298</sup> A next option was the idea of placing the responsibility for sustainable development on one of the commissioners of the National Planning Commission (NPC).<sup>299</sup> A third (and probably the weakest) option put forward was the establishment of a special unit within the DEA which itself was then located within the Ministry of Water and Environmental Affairs. The questions that already exist around the capacity of government departments would tend to undermine any confidence one could have in this option. Furthermore, the fact that the DEA is focussed on issues on the natural environment, and that in the then dispensation, it did not even merit a ministry in its own right, suggests that such a proposed special unit would lack the expertise and the authority to impose its resolutions more widely within the government circles and beyond.

The NSSD1 has not gone for any of three options outlined in the NSSD, but instead has come

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<sup>298</sup> An expanded version of the SA Commission on Human Rights comes to mind here.

<sup>299</sup> It has already been hinted at here above that NPC itself should rather be a Sustainability Planning Commission, but then its location within the Presidency could still be problematical from an independence point of view.

up with a more amorphous scheme which includes aspects of all three options. An overview of this scheme is presented in Table 8.4.

TABLE 8.4: RESPONSIBILITIES FOR THE MANAGEMENT OF NSSD1  
(South Africa, 2011: 37)

<b>PLANNING</b>	<b>IMPLEMENTATION</b>	<b>MONITORING, EVALUATION &amp; REPORTING</b>
National Planning Commission Government cluster plans Government department strategic plans Municipal IDPs Private sector strategic plans Civil society strategic plans	National departments Provincial departments Municipalities Public entities Civil society	Presidency Government, cabinet Parliament Government departments Public entities Municipalities Academia Civil society

Overseeing all of this is a, as yet to be established, National Committee on Sustainable Development (NCSD), while the DEA will be the co-ordinating focal point. “The function of the NCSD will be to ensure that the goals of the NSSD 1 and the Action Plan are implemented effectively.” (South Africa, 2011: 35) One cannot but help feel that with the responsibilities spread as widely as depicted in the scenario outlined here above, that the sustainability initiative of the NSSD1 will (once again) suffer, not so much from the lack of planning as from the lack of (full) implementation. Is not the mere fact that in this chapter reference has been made to a series of policies and plans, many of which cover common ground, evidence of this inability to move beyond the planning stage to the implementation stage? Table 8.1 reminds one too of the incoherency that arises from our fragmented environmental legislation, administered by many departments. One cannot but wonder what happened to the ideal of a statutory commission for sustainable development.

Of more import for the immediate purposes of this study, is to see in what ways the NSSD1 can aid in complementing the structure and the contents of the PSDF. Straight away it can be said that the upper levels of the PSDF seem more than adequate to cover all matters of vision, values and principle that appear in the NSSD1. However at the lower levels of the PSDF there might be some benefit in filling out the framework in the light of the approach followed in the

NSSD1. This will be the assignment for the next sub-section.

## **8.7 FILLING OUT THE PROPOSED SUSTAINABLE DEVELOPMENT FRAMEWORK**

The action plan of the NSSD1 consists of strategic priorities (called strategic focus areas in NFSD), goals, interventions and indicators. The NSSD1 also makes use of headline indicators where a target of sorts is included with each indicator. It is the intention in this sub-section to explore how the PSDF can be augmented in terms of a similar set of descriptors.

First of all it needs to be reiterated that the general trend of the PSDF structure, which moves from the more general and widely applicable at the higher levels of the framework, to the more specific and less prescriptive at the lower levels, still remains valid. One implication of this trend is that the holistic focus and dimensional structure of sustainable development becomes muted at the lower levels of the framework. For example, if a strategic priority is included at a lower level, it may focus on only one element of one dimension of sustainable development. And as this strategic priority may encompass several goals, and each goal several interventions with associated indicators and targets, these will all, in turn, cover ever smaller areas of the wide field of sustainable development. This must of necessity be so; the complexity of the wider issues, the limitations of the theories involved, and the availability of suitable data make the investigation of broader issues not only difficult, but in many cases also too time consuming and impractical. Of course the inherent danger in such a breakdown is that the crucial importance of the bigger picture can be lost, and hence the effect of the interventions can become inconsequential, and in worst case scenarios even unsustainable. This leads to two imperatives – firstly, the superstructure of the PSDF should never be trivialised, nor be allowed to fade into the background. It contains the heart and the “essence” of sustainable development and must serve to inform all the interventions that may be taken in the name of sustainable development. Secondly, it is incumbent upon all sustainable development practitioners, and in particular the national agencies charged with the duty to oversee the implementation of sustainable development, to ensure that the *range* of strategic priorities and goals selected, do justice to the highest degree possible, to the holistic nature of sustainable development, and that all contribute to the bigger picture.

However, because as has been suggested, the broad thrust of sustainable development is less manifest

at the lower levels of the PSDF, it is possible, and also convenient, at these levels to move away from the dimensional structure that has so far been employed in the framework. Furthermore it stands to reason that when it comes to sustainable development priorities, interventions, etc., that these will vary from one situation to another. For example, the priorities and interventions that apply on a national level, compared to those that apply on say, the level of a company or a NGO, can differ considerably. For these reasons it follows that it will be more constructive, rather than attempting to build sustainability strategies into the structure of the PSDF, to complement the existing structure with an additional, but separate, component that will cover all the sustainability strategies, including goals, interventions, etc., for a particular application. Obviously then, while the PSDF itself will remain relatively stable in terms of appearance and content, this additional component can vary from one application to another. This means that sustainable development can be depicted as two separate structures; the top structure will be something like the PSDF (as outlined in Appendix F), and the lower structure, here named the *Sustainable Development Strategies* (SDS), will be one that can vary from application to application, but which will in all cases be informed by the PSDF. The SDS will contain the strategic priorities, here to be named *Key Focus Areas*, that are considered essential for the operationalisation of sustainable development in a particular application. Each key focus area will be served by a number of *Goals*, and in turn each goal will be served by one or more *Interventions*. An intervention is an action which may be taken in order to realise the goal in question. The effectiveness of an action is assessed or measured by one or more variables, here named as *Indicators*. But measurement by itself does not say much about sustainability, unless the measurement can be assessed against some standard, or level which is considered to be sustainable – this is the so-called *Target*. While it might be desirable that the effectiveness of each intervention be assessed by means of indicators and targets, in some cases, for various reasons, such as the lack of reliable data, or uncertainty as to what value, as it may be recorded for an indicator, constitutes sustainability, this might not be possible or feasible. Sometimes when goals or interventions are more intuitive than tangible, their associated indicators and targets may have to be left in abeyance until more clarity, in that particular field, is forthcoming from the theory or practice.

While, as it has been suggested here above, sustainable development is best represented by two separate structures, one subordinate to the other, it also seems that a complete separation between the content of these two structures, as they have been conceptualised here, is not always possible. For example, they both have elements of measurements and applications in them, and an application mentioned in

the first structure, such as the GDP, may also be used in the second to assess a goal of, say, economic welfare. Such links notwithstanding, it may be argued that the first structure deals mainly with generalities, whereas the second deals more with the detail and specifics of a particular application. It must also be mentioned that there is no prescription with regard to the number of key focus areas that make up the SDS – so for some applications there may be many and for others less. Given these provisions, these two separate structures, that together make up a full blueprint for sustainable development, are shown in Figure 8.2.

<b>SUSTAINABLE DEVELOPMENT FRAMEWORK</b>				
<b>DESCRIPTOR</b>	<b>DESCRIPTION</b>			
VISION				
VALUES				
FOUNDATIONAL PRINCIPLES				
DIMENSIONS	<b>Environmental Sustainability</b>	<b>Social Sustainability</b>	<b>Economic Sustainability</b>	<b>Institutional Sustainability</b>
GOALS				
SUBSIDIARY PRINCIPLES				
MEASUREMENT THEMES				
APPLICATIONS				

<b>SUSTAINABLE DEVELOPMENT STRATEGIES</b>			
<b>KEY FOCUS AREA 1:</b>			
GOALS	INTERVENTIONS	INDICATORS	TARGETS
<b>KEY FOCUS AREA 2:</b>			

FIGURE 8.2: BLUEPRINT FOR SUSTAINABLE DEVELOPMENT

Based on information drawn mainly from the NSSD1, an incomplete table of sustainable development strategies has been drawn up to serve as an example of what such a table may look like in the context of governmental practice, and it is presented in Appendix I. The fact that this is only an example underlines the point that the bottom structure of the sustainable development blueprint of Figure 8.2 is very much context driven, and that in other contexts the content of this table could look quite different.

Once again it has been possible, in this chapter, to expand on the conceptualisation of the complex concept of sustainable development. With this background of a fuller understanding of what is meant by sustainable development, and insight into how it is officially seen in South Africa, two South African case studies will be discussed in the next chapter.

## CHAPTER 9

### HOW SUSTAINABLE ARE DEVELOPMENT ACTIVITIES IN SOUTH AFRICA?

Clear the land of evil, drive the road and bridge the ford.  
Kipling<sup>300</sup>

Does South Africa, in common with much of Western society, still pursue, in general, the colonial ethic reflected in the above words of Kipling, or is it more focussed on sustainable development? While one might be inclined to think that the latter alternative applies, given the extent to which sustainable development is circumscribed by South African legislation and policy (see the previous chapter), the question can really only be answered by assessing what is happening on the ground. That is what will be attempted in this chapter, by means of working through two case studies. The development activities described in these case studies will be analysed against the sustainability guidelines and prescriptions embodied in the sustainable development framework proposed in this study (the PSDF, see Appendix F). In this way it is hoped to bring into clearer perspective, the challenges that development in South Africa in general, and civil engineering in particular, face in this regard.

The PSDF is based on certain ethical values. Some of the decisions made in civil engineering practice could be contentious precisely because they involve values that do not promote sustainability, that is to say, they run contrary to the ethos of the PSDF. These may be values held by the engineers themselves, or values held by the developers, or the authorities, or the interested and affected parties, or the public in general. It is these contentious issues, and their underlying values that the investigations into two case studies in this chapter, will attempt to uncover. Engineers do sometimes argue that their practice is based on objective facts, and that as such, it is value-free, but the validity of this contention has already been questioned and dealt with in Chapter 2. However the goal of objectivity in engineering practice still remains a desired objective. It will be shown, in the second of the case studies to be considered, that this issue of objectivity played a critical role in its unfolding. Of course, in engineering practice many important questions do relate to issues that are relatively objective, such as, for example, those around the design procedures, the methodologies employed and the standards of practice, but these will, in this chapter, only be alluded to when they are germane to the issues in contention.

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<sup>300</sup> A Song of the English, Rudyard Kipling (1953, The Oxford Dictionary of Quotations. (p. 301). London: OUP).

Obviously while some sustainable development methodologies or tools might in certain circumstances be technically more efficient or appropriate than others, the discussion here will generally be more focussed on the sustainable development *values* and *principles* involved.

It must also be acknowledged that even those who analyse case studies tend to bring their own values to the investigations, and that their conclusions are likely to be coloured, at least to a degree, by these values. That must be true of this study too. In an attempt to be forthright about the values that may play a role here, it can be stated up front that this study fully endorses the values that are incorporated into the proposed sustainable development framework of Appendix F. The vision, values and principles integral to the PSDF have been articulated and extensively defended in previous chapters, and as these aspects of the framework were derived through a broad ranging examination of the relevant literature, they can lay claim to wide, if not universal acceptance. Hence it is argued here, they may justifiably be used here to inform the investigations to be conducted in this chapter.

As has been mentioned, two case studies will be central to these investigations. The first of these case studies deals with the proliferation of golf courses and golfing estates in the Southern Cape, and the second with the proposed construction of a national road through an area of great natural beauty and biodiversity in the Pondoland region.

## **9.1 GOLFING ESTATE DEVELOPMENTS IN THE SOUTHERN CAPE**

While it has been indicated in the introduction to this chapter that the emphasis in the case study investigations to be conducted here, will be on civil engineering practice, it needs to be noted that in the first of the two case studies, this emphasis will be somewhat muted. Golfing estate developments, the topic of this case study, obviously involve the construction of golf courses, proximate residential precincts and the associated infrastructure, and as such comprise fairly large scale civil engineering works. All infrastructural developments, and perhaps even more pointedly golfing estate developments, take place against a background of certain societal values and choices. If golfing estate developments are contentious, it is not so much the values of civil engineering practice that come into question, but more so those of society at large in relation to these developments. The controversies around golfing estate developments, particular in the Southern Cape, reflect fairly clearly the competing values held

by various societal factions, and in these factional disputes, civil engineering is mostly an unwitting accomplice. Hence it is considered appropriate that in this case study attention be primarily focussed on the broader societal issues, but in the conclusion, attention will return to role of civil engineering in these societal disputes

Golf is a sport that is mostly followed by the more affluent sections of society, and it is probably fair to say that in South Africa it still is, by and large, a 'white' sport. Given the racial history of the country and the large, mainly racially aligned, wealth differentials that still prevail, it follows that golfing estate developments can easily become implicated in a complex social imbroglio in which racial tensions feature prominently. In this vein the former South African President, Thabo Mbeki, is reported to have blamed golfing estates of perpetuating the divisive racial and wealth patterns of the apartheid era (Mbeki, 2005).<sup>301</sup> But, on the other hand, the promoters of golfing estates claim that these developments actually advance society on all levels. These developments, they claim, attract investments and tourism, in addition to providing such direct benefits as increased employment opportunities and community upliftment programmes. Aside from the social issues, golf also has a unique environmental impact. Unlike most other sports, golf does not have a defined size and layout of its playing area, and its spatial footprint is especially large. Particularly in rural areas its impact on the natural environment can be considerable. And this impact becomes even more critical when the golfing estate is to be located in an area of high natural value and beauty, such as is often the case in the Southern Cape. Again some will argue that these negative impacts can be countered by corresponding positive impacts. Golf courses, they say, can act as green havens, particularly in urban areas. They provide refuge for smaller animals and birds, they beautify the surroundings and enhance the provision of ecological services. Given the contention between the mix of social, economic and environmental issues involved in the development of golfing estates, it seems that they can be a particularly exacting testing ground for sustainable development, in theory as well as in practice.

In the following discussion attention will firstly be focussed on those characteristics peculiar to the Southern Cape region, and which are under threat due to the impacts, potential and real, of the many golfing estate developments in the area. Next the impacts themselves, both positive and negative will be discussed. It is the combination of all these factors, as they manifest themselves in the Southern

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<sup>301</sup> In this chapter it is in the nature of the material being covered that many of the references used and quoted, are from internet sources or media releases where often there are no page numbers.

Cape, that has grabbed the attention of the public and interest groups alike, and that has led to heated press campaigns and fierce protest marches. Most of the latest golfing developments in the Southern Cape have been subject to EIAs, which seems to have highlighted, rather than resolved, the contentious issues around these developments. It is against this background of widespread concern about the proliferation of these upmarket developments in the Southern and Western Cape, the claims of their socio-economic benefits, and the counter claims of their negative environmental and social impacts, that the Western Cape Provincial Government<sup>302</sup> (WCPG), through its Department of Environmental Affairs and Development Planning (DEADP), launched an urgent investigation into these developments. This investigation culminated in a report produced in 2005, the *Rapid Review of Golf Course and Polo Field Developments* (DEADP, 2005a).<sup>303</sup> In view of this and other sources of information around the impacts of golfing estates in the mentioned areas, it is not considered necessary to re-investigate all the relevant factual issues here, but rather to simply overview them as a prelude to the discussion of the underlying value conflicts as they relate to sustainable development.

### 9.1.1 Characteristics of the Garden Route

While the locality of concern has thus far been denoted as the Southern Cape, it is more specifically the coastal region of the Southern Cape that is of concern. This area is widely known as the Garden Route, a name that is evocative of its natural charm. While development has made heavy inroads into this area, it still remains an area of great natural beauty. In the words of Barbour it is the

... combination [of] environmental factors, specifically climate, vegetation and topography, [that] make the Garden Route Region a unique area within the South and Southern African context. These factors have combined to create a region that boasts a diverse range of terrestrial, freshwater and marine ecosystems, including rugged mountain ranges, spectacular coastline, indigenous forests and fynbos vegetation, perennial rivers, productive estuaries and fertile soils. These factors, together with the region's moderate climate, have also ensured that the region is an extremely attractive location for human habitation. (2002: 3)

As Barbour suggests, it is exactly the beauty and temperate conditions of the area that attracts humans to it, and as a consequence, it is under serious developmental pressures. It goes without

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<sup>302</sup> Most of the Southern Cape falls within the Western Cape Province.

<sup>303</sup> For ease of reference this report will from here on simply be referred to as the *Rapid Review*.

saying that these pressures could, if not properly managed, eventually destroy the beauty and uniqueness of this area, which are its attractions in the first place.

As it is to be expected, the perspective of the statutory conservation body of the Western Cape, *CapeNature*, has a biodiversity focus – it contends that

the Southern Cape is a truly unique and very special area. Two of the 27 globally recognised biodiversity hotspots, namely the Fynbos and Sub-Tropical Thicket biomes, occur here. Both these biomes are known to be very rich in species, many of which are endemic to the region. The two biomes often become intertwined to form mosaic vegetation units, which are rich in localised endemic species adapted to the specific mosaic habitat conditions. (Cape Nature Conservation, 2004: 1)

And then *CapeNature* expresses its concern as follows:

The proliferation of holiday resorts, and particularly large-scale developments such as polo fields, golf courses and golf estates in the Southern Cape coastal area has now reached a stage where intervention at a high level is required. More and more of the last remaining natural areas containing critical habitats for plants and animals are being fragmented and destroyed by developments at an alarming rate. Ecological corridors linking the mountains to the sea, as well as corridors along the coast, are now almost impossible to establish. (Cape Nature Conservation, 2004: 1)

The Garden Route area experiences a migratory inflow of people, and very little outflow, which means that the population of the area is steadily increasing. Two patterns are discernable in this inflow; firstly there are work seekers, mostly unskilled, and who enter the area from beyond its borders in order to seek employment, and then secondly there are also more affluent people, who move into the area for the purpose of retirement. In both cases the economic contribution of these groups to the region is minimal or limited. Unemployment in the region is high and the authorities are keen to attract employment creating developments. (Hence it is not surprising that the employment opportunities associated with golfing estate developments feature prominently in the promotional strategies adopted by the developers.) There is also a movement of work seekers in the region from the rural parts to the towns, and this together with the general in-migration places stress on the delivery of municipal services. This is exacerbated by the inflow of seasonal visitors, which in peak holiday seasons leads *inter alia* to water shortages and traffic congestion. Being readily accessible by road and air contributes to the permanent and seasonal influx of people to the Garden Route (Van Zyl, 2006: 4-9). Tourism in the region is

growing, and the associated economic injection and employment possibilities make it an attractive developmental strategy. Hence the drive by some of the authorities to attract golf tourism. Van Biljon asks the question, “Could the Southern Cape soon become the world's top seaside golfing destination?” and then goes further to suggest that we

may have a ‘once in a lifetime’ opportunity to do something great here ... Our window of opportunity will not last forever! ... As the new kid on the block, can we become untouchable as a seaside golfing destination ... (2004: 1)

Any golf course, irrespective of where it is situated, will have environmental (broadly understood) impacts, and in its design and construction these impacts have to be taken into account. But over and above the impacts of a single golfing development, it is also the cumulative impacts caused by the proliferation of these developments in the Garden Route that causes concern. In 2006 at least 22 golfing developments already existed in this region, and of these nine could be categorised as golfing estates. A further eight golfing estates were being proposed (Van Zyl, 2006: 30, 31). No doubt the natural beauty of the Garden Route attracts these developments, but as has been outlined here above, it is *inter alia*, their perceived threats to this natural beauty which, in the eyes of many, render further golf developments in the Garden Route undesirable. And so it is the impacts of golfing developments on the natural and social environments of the Garden Route to which attention will be turned next.

### **9.1.2 Negative environmental and social impacts of golfing developments**

While the first golf courses originated in areas where the landscape was particularly suited to their layout, and thus required very little by way of land shaping, today with the availability of modern construction equipment, sites may be selected simply for their perceived economic return irrespective of the land shaping requirements. This means that the environmental impacts of modern golfing developments are generally significant.

#### *a) Water needs*

One of the most often expressed concerns about the many golfing developments in the Southern Cape is the demand these developments place on the water resources of the region. It has been estimated that the water use of an 18-hole golf course can vary be between 1,2 and 3 million litres of water per day, which equates to the basic water needs of between 6000 and 15000

households (Montgomery, undated: 2). This water is usually sourced from either municipal supplies or proximate river systems. But according to surveys the river systems of the “Southern Cape are already severely stressed due to over-utilisation” (Cape Nature Conservation, 2004: 3). The water problem has become particularly contentious in recent times due to the severe and prolonged drought conditions that have been experienced in the Southern Cape.

Many of the later golfing developments have planned to ameliorate this problem by making use of recycled water, but this in itself can be problematical. Depending on the sources of the recycled water, it is likely that the recycled water can lead to nutrient enrichment of the soils adjacent to the watered areas. This would be detrimental to the fynbos in these areas, as fynbos is particularly adapted to nutrient poor soils. (Cape Nature Conservation, 2004: 3)

As “South Africa has run out of surplus water, with 98% already allocated at a high assurance of supply” (Montgomery, undated: 1), the development of even more golfing estates must be questioned, and it may be that the issue of water supply alone is enough to fatally flaw their viability.

#### *b) Chemical pollution*

The potential negative impact of fertilisers on fynbos has already been touched on, but in addition, their use could also encourage the proliferation of alien species. When drainage water containing excess fertiliser enters water bodies, this could lead to the eutrophication of such water bodies.

The application of pesticides and herbicides can also contaminate the groundwater and linked water bodies. The effect of these chemicals on plants, insects and animals could upset the ecological balances of the area, thereby affecting the viability of the natural areas within and around golf courses. (WESSA, 2004f:1)

#### *c) Alien vegetation*

It has been mentioned that the nutrient enrichment of the soils would encourage the growth of alien plants, but in addition it is also the intentional planting of alien species in the gardens of

the residential components of golfing estates that could exacerbate the problem. On the golf course fairways and greens the use of exotic grasses may be the origin of the invasive spreading of these plants. (WESSA, 2004f: 1)

*d) Habitat loss and fragmentation*

Not a few of the golfing estates built and planned in the Southern Cape are located in rural, and sometimes pristine areas. The loss of natural habitat is an obvious impact, but the fact that many natural plant species in this region have been classified as 'endangered' or 'critically endangered' makes the loss of further natural areas a serious problem. In addition it is also the fragmentation of these natural areas that is problematical, in that the ecological processes needed to maintain the functionings of the natural systems in these areas, are threatened. For example, fire plays a critical ecological role in the fynbos and renosterveld of the Southern Cape, and its natural occurrence will be inhibited by golfing developments. Furthermore, if fires are artificially instigated by estate managers under the wrong conditions, they could actually have a negative rather than a positive impact. (Cape Nature Conservation, 2004: 2)

*e) Urban sprawl*

As has been mentioned, many of the golfing estates in the Southern Cape are situated outside urban areas, but with their residential components being in effect small, low density towns, they contribute to unforeseen urban expansion. This not only makes additional demands on the already stressed municipal services, but also increases traffic flow and spawns other developments, such as shopping centres, on the urban edge. (WESSA, 2004f: 1)

*f) Loss of agricultural land*

In those instances where golfing estates occupy land previously used for agriculture, it may of course imply less agricultural production for the region. While food imports into the region may overcome this problem, the more permanent impacts that remain are the loss of employment opportunities for farm workers, and the negative effects on land reform initiatives in the area. The large land footprint of golfing developments, and their contribution to the sharp rise in the price of land, makes less land available for both restitution purposes and for leasing to subsistence farmers. (SCLC, 2004)

*g) Loss of access to natural resources*

Access to beaches and other recreational areas can be compromised when large tracts of land become reserved for the golfers and residents of golfing estates. While this may impact on all who live around these golfing estates, it weighs more heavily on the poor who, for example, need access to the coast for fishing to supplement their food supply, or who gather firewood from open land, or whose traditional routes to amenities such as schools and shops are cut off. (SCLC, 2004)

*h) The perpetuation of differential patterns of wealth*

Given the costs involved, the players, tourists and residents who are attracted to golfing estates usually are relatively wealthy. Yet the Southern Cape is also the home of many poor, unemployed people, and in many cases these people live close or adjacent to the golfing estates. Wealthy, exclusive enclaves surrounded by poverty suggest a fertile ground for social discontent. And because many of the wealthy are white and many of the poor are people of colour, the racial battlelines of the past are all too easily resurrected. For example, Yeld writes,

Many people living on the Southern Cape coast now openly suggest that the new golf, polo and other residential estates mushrooming on the Garden Route constitute a new form of apartheid – this time, an economic apartheid, where the wealthy barricade themselves in luxury laagers, often hewn from beautiful but environmentally sensitive natural areas, and where non-residents are only permitted during the day to perform menial tasks before being sent out again as night falls. (2004:1)

### **9.1.3 Positive aspects of golfing developments**

The developers of golfing estates, aware of the many arguments against their developments, try in turn, to present counter arguments which emphasise the positive aspects of such developments.

*a) Economic injection*

The most common argument used in favour of such golfing developments is the economic injection that they provide to the region. This involves the stimulation of local industries, particularly during the construction phase through local procurement and the direct involvement of local contractors. Once established golfing estates continue to stimulate the local economy

through the purchasing power of residents and visitors. Golf tourism is regarded as a lucrative generator of foreign income and investment. These economic arguments in favour of golfing developments are often countered by charges that the actual benefits are exaggerated. Against this background of claims and counter claims, the *Rapid Review* investigation team attempted to assess the economic impact of golfing in the Western (and Southern) Cape (DEADP, 2005a: 17-30). They looked at the economic impacts of:

- the golfing industry as a whole
- a single golf course
- a residential unit on an estate
- leisure developments, such as hotels, spas, etc., associated with golfing estates
- golf tourism
- golf events (such as international competitions).

In the course of these assessments many assumptions had to be made, and where information was completely lacking, or inadequate, certain contributing factors were excluded from the assessments. And so, except for the direct costs and incomes, many of the economic benefits attributed to golfing establishments were difficult to verify. Notwithstanding these problems it seemed that the economic contribution of golfing estates to a region could be substantial.

#### *b) Employment opportunities*

Allied to the economic argument the proponents of golfing estates make much of the employment opportunities created by these developments. This is deemed a powerful argument in the face of high levels of unemployment in the region and the commitment of government to job creation. Again the detractors would charge that these claims around the creation of employment opportunities are exaggerated. They argue that many of the employment opportunities are of a temporary nature, such as those that only exist during the construction stage, or those that result from the influx of visitors during holiday periods. In addition, it is also said that many of the residences on the golfing estates are not permanently occupied, and that therefore they only generate intermittent employment. It is further charged that most of the employment opportunities created are of a menial nature, such as caddies, gardeners and cleaners. Again the *Rapid Review* report however concluded that employment data was too scarce and variable to make definitive assessments (DEADP, 2005a: 30-38). It confirmed that

most employment opportunities were at the unskilled level, but did not regard this as negative as it is at this level that there is the greatest need in the region. While the investigation confirmed that the racial mix of employment on the golfing establishments reflected the demographics of the region, it also confirmed that most of the lower level positions were filled by people of colour, and the management level positions were largely filled by whites. While caddies could make up as many as half of the numbers employed on golf courses, during international golf tournaments these positions were often occupied by outsiders due to the skill levels involved. Some golf courses did not even employ caddies, ostensibly because of the security risks involved. The report confirmed not only the temporary nature of the employment opportunities during the construction phase of these developments, but also the problems that arose around the influx of workers from areas further afield. This influx obviously impacts negatively on the employment of local people, and may on completion of the construction period even worsen the unemployment in the area.

*c) Upliftment programmes*

To strengthen their hand developers often commit themselves to upliftment programmes in the surrounding communities, and in this way, depending on the promises made, they are at times successful in getting these communities to support their developments. This in itself can be a source of discord in the local population, as the poor and the unemployed, in their newly found support for a development, might now oppose other locals, who are employed and maybe not as needy, and who might be more concerned by the impacts of such developments on the natural environment, and the loss of sense of place that they bring about.

*d) Environmental improvements*

Much is made of the loss of natural vegetation and habitation, and the loss of agricultural land caused by the establishment of golfing estates. But there are also counter arguments. For example, it has been claimed, at least in the case of some of these developments in the Southern Cape, that they are actually taking up land that has already been degraded by improper agriculture use, and which as a consequence is of little value anyway. Thus it seems that it cannot be a general rule that the land occupational impact of golf courses is necessarily always negative. Where golf courses are located on land that has already been degraded, be it through heavy agricultural use, or other degradative uses, such as waste disposal sites, then the land in

question may actually be “improved and beautified through [its] adaptive reuse as a golf course”. (Love, 2008: 7)

Furthermore, it has been claimed that golfing establishments, if properly managed, can actually improve the ecological functioning of the land by acting as a haven for indigenous nature and endangered species. At the Royal Johannesburg and Kensington golf course there has, for example, been an active campaign to get rid of invasive trees, and to establish wetlands with suitable indigenous species.

1300 indigenous trees have been planted ... Both the already existing watercourses and the new series of wetlands, planted up with suitable indigenous species, attract and support water-loving wildlife species ... Other areas of the golf course have been planted up with indigenous veld grasses. These have attracted seed-eating birds, field mice and mongooses ... [It is] estimated that the new plantings and habitats more than trebled the bird life on the golf course, and increased the number of bird species sighted by members of the club. (Montgomery, undated: 10)

*e) Alleviating water demand*

Water use is another sphere in which golf courses can make an environmental contribution by reducing their environmental water demand. Many new golfing estates are planned so that the waste water generated on site can be cleaned and re-used again. Alternatively recycled water may also be obtained from a local authority. While the caveats against the use of recycled water have already been mentioned, with careful management the potential problems can be minimised, if not altogether eliminated. In the process of using municipal effluent on a golf course it in fact gets cleaned further. Cases are on record where a municipality has constructed a golf course for the main purpose of cleaning its waste water.

The dense turf grass found on golf courses provides one of the best filtration systems available for polluted water. Particulate pollutants in the water are trapped and held in the layer of thatch, where they are allowed to degrade naturally. In this way, effluent that is used on the course is cleaned and returned to dams, streams and groundwater supplies. (Montgomery, undated: 28)

Savings in the water requirements of a golf course may also be effected by various other means. With a careful course layout, possibly assisted by a sub-surface system of drains, the collection of the natural run-off from the area can be used for irrigation purposes. It goes without saying that an efficient and well managed irrigation system will also ensure that water is not wasted. The use of low water demand or indigenous turf grasses and plants on respectively the playing

areas and non-playing areas, and the maximisation of the latter areas will all contribute to a decrease in the overall water demand.

*f) Environmentally progressive establishments*

By taking all of the above into account and also many other aspects such as the reduction in carbon emissions, the safe use of chemicals, the reduction in energy demand and the switch to renewable energy sources it is possible for a golfing facility to become 'eco-certified'. This means that the golf course and estate is run according to certain guidelines with the objective of promoting environmental integrity, and that it has been subjected to an external verification of its actual and continued commitment to this objective. In South Africa the *Heritage Environmental Rating Programme* can perform this verification service, and internationally there are various options such as the *Audubon Cooperative Sanctuary Programme* and *ISO14001*. (Montgomery, undated: 10-15)

#### **9.1.4 Are golfing estates in the Garden Route good or bad?**

From all the arguments and counter arguments that have been presented in the preceding subsections, it seems obvious that there can be no generally accepted answer to the above question. It is obvious that golfing developments can produce some good consequences and at the same time also some bad consequences, but the questions as to which outweighs the other remains unresolved. That the Garden Route has a unique environmental heritage which is put in danger by further developments with a high spatial demand is clear, and yet in this region there are social circumstances of poverty and unemployment that cry out for development. In these circumstances golfing developments seem to epitomise the environmental dilemma which is characterised, in simple terms, as the conflict between environmental conservation and societal development. But when both environmental conservation and societal development are imperatives, as is the case in the Southern Cape, and when golfing developments offer both positive *and* negative environmental impacts, and both positive *and* negative social impacts, how can one decide between all these competing issues?

If the above question is intractable in general, it is no less so for the members of the civil engineering fraternity who are involved in the golfing estate developments in the Southern

Cape. The simple answer to this question is that all developments must conform to the principles of sustainability. But then, does the balance of the impacts of golfing developments in the Southern Cape contribute to sustainable development or not? By and large engineers rely on the environmental impact assessments done for each of these developments to provide the answer for them. However the ability of EIAs to ensure sustainable development is questionable. The *Rapid Review* report picked up on the problematic issues around EIAs (DEADP, 2005a: 75-78), and it found that the EIAs that had been carried out, were wanting in several respects. All EIAs done of golfing developments in the Western Cape, from soon after the date at which they became mandatory, were reviewed. It became apparent straightaway that the earlier developments were more readily passed than the later ones. In many of the earlier cases, for example, they were passed on the basis of the scoping report only, while latterly a full EIA was required. This was attributed, at least in part, to the initial “uncertainties relating to how the [EIA] Regulations should be administered and applied” (DEADP, 2005a: 77).

Further problems that emerged from the reviewed EIA reports were:

- the superficial nature of some of the reports
- the inadequate scoping of issues
- the lack of investigation into key issues (particularly social and water use impacts)
- evidence of simplistic assumptions that negated the significance of key impacts
- the pre-empting of the public participation process by undertaking specialist studies at an early stage
- the lack of investigation into wider biophysical impacts, with focus often being on only species that occur on the site, rather than the consideration of habitats and ecosystem processes
- often the assessment of significance was not rigorous and consistent
- public participation processes which did not enable meaningful input or opportunities to influence the decision
- the lack of adequate information on mitigation measures (DEADP, 2005a: 77-78).

It was furthermore also found that the monitoring and evaluation of the implementation of the post-construction conditions were lacking, maybe due to the DEADP not taking its role as an monitoring agency seriously enough, or possible because of not having sufficient qualified staff

to do the monitoring. As has been mentioned, inconsistency in decision-making was also a problem with some applications being more readily approved than others (DEADP, 2005a: 78). It is a fact too that political interference has occurred, one example of which became public through the court case dealing with the Roodefontein Golf Estate.<sup>304</sup>

While it is required that all proposed golfing estates have to undergo an EIA, and assuming that the shortcomings in the EIAs as outlined here above can be rectified, the question that remains is whether the EIA process itself is the most effective way to promote sustainable development, and hence of trying to control golfing estate developments in the Southern Cape. Certainly some EIA methodologies must be better than others, but more fundamentally the question is whether an EIA is the appropriate tool with which to address regional sustainability problems. While the detail of EIA methodologies are considered to be outside the scope of this study, the appropriateness of the EIA as a broad scale sustainability assessment tool will be touched on briefly.

An EIA is needed when a certain development falls into the category of “listed activities”. A “listed activity”, according to NEMA, is a type of activity that has been identified by the Minister (of Environmental Affairs) as one that can produce significant impacts on the environment (South Africa, 1998: S24).<sup>305</sup> This type of activity will need an environmental authorisation before it can proceed. The authorisation is granted by the national or a provincial department of Environmental Affairs on the basis of an EIA report, which is submitted by an environmental assessment practitioner, on behalf of the developer. Thus, by its very nature, an EIA is focussed on a particular project, and as such is not suited to assess the cumulative effects arising from multiple, proximate developments. In such a case what is needed, is a broader, regional focus, and the appropriate tool for this is a *strategic environmental assessment* (SEA). Instead of being project focussed, a SEA is focussed at a policy level. A SEA should thus be able to assess the sustainability potential of golfing estates on a regional basis, and from such an assessment of the Southern Cape region may flow a policy to guide the development of golfing estates in the Garden Route.

The role of SEA ... is to allow for the decision-maker to pro-actively determine the

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<sup>304</sup> 50/50 TV programme on SABC2, screened on 18 May 2003.

<sup>305</sup> Activities of which the significance of their impacts is uncertain may also be listed.

most suitable development type for a particular area, before development proposals are formulated. [It is] used to assess the effect of the existing environmental and socio-economic conditions on development opportunities and constraints [in this area]. (DEAT, 2004c: 4, 5)

A SEA of the Garden Route would assess, *inter alia*, the value and status of the biodiversity, the potential water supplies, the socio-economic needs and the tourism potential of the region. With such a comprehensive databank available, the desirability and location of golfing developments in the Garden Route could be determined before much money has been (possibly wastefully) invested in them, and before they became social battlegrounds.

The fact that no such SEA is available for the Garden Route is a governance shortcoming. While SEAs ideally precede development activities, it was only in 2002 that a firm proposal for such an SEA for the Garden Route was made (Barbour, 2002). While it is not clear why this proposal was not taken further, the Provincial Government of Western Cape (WCPG) did, as has already been mentioned, commission the *Rapid Review* (DEADP, 2005a) investigation in 2004, and subsequently it produced a comprehensive set of *Guidelines for Golf Courses, Golf Estates, Polo Fields and Polo Estates in the Western Cape* (DEADP, 2005b). These guidelines were formulated to assist not only decision-makers, but also developers and other interested and affected parties towards more sustainable solutions.

In short, the aim of these guidelines is therefore, in principle, to promote sustainable development by:

- a) strengthening of application and decision-making processes;
  - b) improving certainty, predictability and consistency, and
  - c) ensuring transparency and fairness throughout the public participation process.
- (DEADP, 2005b: 6)

The guidelines require that, unless there are special conditions that would warrant an exception, golfing developments be located within the urban edge. In addition the minimum information required of the EIAs of these developments is also specified. The guidelines also cover design considerations which improve the sustainability of these developments, e.g. they address the topics of water use and stormwater disposal. Requirements for the public participation are also addressed. The guideline document concludes with sections on the responsibilities of decision-making authorities and the post-construction management procedures.

In addition to the *Guidelines for Golf Courses, Golf Estates, Polo Fields and Polo Estates in*

*the Western Cape* the WCPG has also produced *Guidelines for Resort Developments in the Western Cape*, a *Provincial Urban Edge Guideline*, and a *Western Cape Provincial Spatial Development Framework*.<sup>306</sup> In a certain sense it can then be said, that collectively all of these reports are in effect a strategic environmental assessment, at least from a technical perspective. While one cannot gainsay the valuable work done by the WCPG in producing these reports, it may still be argued that the structured, coherent and holistic character of an SEA, and its singular focus on sustainable development, is missing. Ideally speaking the SEA should also of course precede developments, and not be done after problems with the developments have become apparent.

In the end though one may still have to acknowledge, that even with an SEA in place, that developments, such as those of the golfing estates in the Southern Cape, could still produce problems. While SEAs, EIAs and the like, may to large extent eliminate the technical problems, one may still have to face the problems that emerge from diverging ethical approaches, and ultimately from conflicting values and world-views. Consider, for example, the nested dimensional model of sustainable development (see Figures 7.1 and 8.1) that “recognizes the role of the natural environment in both the material and spiritual well-being of mankind” (DEADP, 2005b: 7). In other words:

It is based on the acknowledgement that a high level of ecosystem well-being is essential because the ecosystem supports life. The model does not downplay the importance of human wellbeing. In fact, it is based on a wide definition of this concept, which includes human well-being, social health and human development. What it does is to make the point that human health and well-being is directly linked to the “health” or state of natural systems. (DEADP, 2005b: 7)

While the above quotations from the WCPG’s *Guidelines for Golf Courses, Golf Estates, Polo Fields and Polo Estates in the Western Cape* accord some pre-eminence to the natural environment, what guarantee is there that the other role players in the development process will hold the same views? Might there not, at the heart of the many conflicts that emerge around the golfing developments in the Garden Route, be a divergence between an anthropocentric/instrumental and a non-anthropocentric/intrinsic valuation of nature? It seems that the possibility of such value conflicts may have to be accepted, with the hope that Norton’s

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<sup>306</sup> All available from the DEADP at <http://www.capegateway.gov.za/eng/yourgovernment/gsc/406>. [Accessed 12 June 2008].

“convergence theory”, and the pluralistic, pragmatic approach endorsed by the PSDF will present a way forward out of such an impasse. The problems could of course also be on a lower ethical level. Based on a survey done in the Cape Town environs, Hattingh and Seeliger identified the following ethical problems that are perceived to exist around environmental decision-making:

- the low adherence to legislation by developers
- the political motivations behind decisions
- the potential of consultant bias resulting from being in the employ of the applicant
- the relationship between applicants and decision-makers that can be too close
- the use of personal contacts within decision-making bodies by applicants in order to get projects approved
- inconsistency in decision-making (DEADP, 2005b: 8-9).

To put a more concrete face on the value conflicts and ethical problems that may unfold in a golfing estate development, a particular case, that of the LagoonBay Lifestyle Estate, will be considered next.

### **9.1.5 The LagoonBay Lifestyle Estate development**

It is claimed that the proposed 800 ha LagoonBay Lifestyle Estate,<sup>307</sup> between George and Mossel Bay, will be the largest golfing estate development in the Western Cape. It is also claimed that it will be one of the most progressive developments of its kind, and yet it has been mired in controversy virtually since inception, and it is still the subject of on-going court actions. Its announcement coincided with one of the worst droughts experienced in the Garden Route, and this immediately put into question its water use. Golf developments have a high water demand, and this becomes a critical issue when in the Southern Cape water supplies are under pressure. The LagoonBay developers intend to address this issue by making use of recycled water from the George Municipality; the effluent from the fully developed estate which will also be reused, and together these sources may be sufficient to meet the estate’s water needs (De Beer, 2009). However it is not the intention here to digress into the technical problems around this development – problems, such as the water issue, have already been dealt

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<sup>307</sup> For the moment this development has been stalled due to legal wrangling.

with in general – instead, after the characteristics of the development have been briefly reviewed, attention will turn to the value conflicts that have dogged this development.

Although the Environmental Impact Report for the LagoonBay estate allows for alternative layouts, the following gives an idea of the proposed land use within the development:

- physical development – 200 ha (with 50% coverage = 100 ha)
- golf courses and public open space – 166 ha
- land reform agriculture within the development – 65 ha
- biodiversity conservation – 285 ha (Van der Merwe, 2008: 7).

The development itself will comprise of the following:

- two championship golf courses
- golf clubhouse and associated amenities
- approximately 820 estate housing units
- approximately 100 villas
- 150-room 5-star international hotel together with spa and wellness centre
- conference facilities for 200-300 people
- a lagoon restaurant and conference facility for 50 people
- a chapel
- community village that includes 40 houses, a community hall, a church, sports fields, and a school, and
- a commercial centre which includes a food outlet, restaurants, shops and offices (Van der Merwe, 2006: 88).

The proposed LagoonBay development is different to other golfing developments in an important respect. In theory the LagoonBay development is a subsidiary component of a broader social and environmental development initiative which is called the Hoogekraal<sup>308</sup> Sustainable Development Initiative (HSDI); in short, the golfing estate is merely a component of a broader development initiative. In other golfing estate developments, the social initiatives associated with them are subsidiary to the developments themselves – add-ons, some would say, to make the development socially more acceptable. Even for the LagoonBay development,

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<sup>308</sup> Hoogekraal is the historic name of a farm in the area the LagoonBay development.

the cynical would argue that the HDSI is simply a ploy on behalf of the developers to make their proposed golfing development appear more acceptable to the local community and the powers that be. Be that as it may, the HDSI certainly comes across as a structured, broadly based development initiative, the social component of which is far more central to the development than what the case is with the social development components of the other golfing estates in the Garden Route.

The HDSI is an example of a project-based *sustainable development initiative* (SDI), which is a purpose-driven strategy to uplift a defined area socially and environmentally. It is based on three premises, the first of which proposes

that property development can serve as a primary economic driver that unlocks funds to support, in a meaningful and sustainable manner, economic growth, social development, and environmental rehabilitation ... In order to optimise the potential of property development to serve as an efficient economic driver, the SDI approach builds upon the principle that an SDI, for any given area, must be supported by a core project, or a number of core projects, and must utilise and promote the comparative economic advantages of the region within which the SDI is undertaken. (Van der Merwe, 2006: 51)

The second premise is one of inclusivity and community participation.

The SDI approach provides for the participation and involvement of local communities in the planning, implementation and management of the initiative through an appropriate organisational structure ... Participation in the SDI by stakeholders, who purchase property in the core projects, or who may have a direct interest in the core projects, should ideally be formalised through a participation agreement. (Van der Merwe, 2006: 52)

The third premise is one of environmental rehabilitation and conservation.

The SDI approach recognises and supports the principle that biodiversity conservation is a prerequisite for sustainable development (Van der Merwe, 2006: 53).

The HDSI is anchored by the Hoogekraal Treasury Trust which will fund various community-based developments and environmental rehabilitation projects. The Trust will be chaired by a high court judge and the community will be represented by their chosen trustees. The Trust itself will be funded by the percentage of the sale and resale of properties on the estate. It is estimated that the income to the Trust from the initial sales would be R40 million and that thereafter resales would contribute R8 million per annum (GRI, 2004: 40).

The LagoonBay development is expected to have direct and indirect economic impacts of approximately R12 million during its construction phase, and at the same time to create 18000 employment opportunities<sup>309</sup> within and beyond the borders of the development. Over the longer term a gross economic impact of approximately R280 million is expected, and more than 1000 new permanent employment opportunities on site are envisaged. The social objectives of the HSDI would include the provision of housing for the local, previously disadvantaged, people, and also the already mentioned employment opportunities. Additionally, empowerment through education, training, and integrated agricultural enterprises is envisaged. The environmental objectives would include the restoration of degraded farm land, the removal of alien vegetation, the rehabilitation of wetlands and the provision of eco-corridors. In addition, the physical development will be limited to low-potential agricultural land where no natural habitats remain (Van der Merwe, 2006: 90-95).

While many of the positive aspects of the LagoonBay Lifestyle Estate development have been outlined here above, it has also attracted strong criticism and provoked protest actions. The arguments against this development echo many of the reservations expressed previously against golfing developments in the Southern Cape in general. The problems of water use, the loss of agricultural land, the loss of habitat, and the sidelining of the local communities, are the counter arguments typically employed, but the LagoonBay development has, it appears, gone to great lengths to address these problem areas. While some of these issues can be resolved technically, for the others, one would imagine that, through interaction between the role players, and given the many positive aspects of the development, solutions or compromises are possible. But notwithstanding this potential the LagoonBay development remains mired in contention. Much of this contention may be, as has already been suggested, rooted in value conflicts. All sides claim to support the notion of sustainable development, yet in this project, which is championed as a sustainable development initiative *par excellence*, they cannot seem to find much common ground. It is likely, one would think, that many of the role players in the conflict have superficial, and possibly faulty, perceptions of what sustainable development is; they fail to appreciate the full scope of the concept and its underlying values and principles.<sup>310</sup> A snap response to the LagoonBay conflict may thus be that more work needs to be done to explain to

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<sup>309</sup> Here an employment opportunity is defined as one person employed for a year.

<sup>310</sup> See the proposed sustainable development framework in Appendix C16.

the role players more fully what sustainable development entails. The PSDF (or a similar in-depth model of sustainable development) could serve as reference point here. However if a 'conversion' to a 'true' perspective of sustainable development entails a change in world-view, as has been contended by some, it will not happen easily, and it would be unrealistic to believe that the mere trotting out of the PSDF would magically resolve the LagoonBay conflicts. It could nevertheless still be argued that the present, destructive confrontations of the conflict could be tempered by using the PSDF as a constructive instrument of engagement, such that at least the values underlying the conflicts become more clear. In what follows some of the opinions and actions of the various role players in the LagoonBay saga will be recounted in order to get closer to the underlying values at play.

While with some of the other golfing developments in the Southern Cape, opposition to these developments has been evident across the full spectrum of the local community,<sup>311</sup> it appears that the LagoonBay development has divided the community in this regard. After the initial, widespread concern about yet another golf development in the Southern Cape, it is evident that a certain section of the affected community, mainly the poor and unemployed, have been converted into ardent supporters of the project. Quite likely this is the result of the advantages that they see accruing to themselves through the activities of the HSDI. On the other hand, others, including neighbouring landowners from the village of Glentana, are so opposed to the development that they have launched court actions against it. This has led to aggressive confrontations between the supporters and the opposers of the development. A supporting grouping, organised as the George Leadership Forum (GLF), are suspected of being involved in alleged threats of violence, and acts of sabotage and arson. The GLF has denied involvement in any of these actions, and yet they have threatened to make George "ungovernable" if their demands are not met. Both sides in the confrontation raise the charge of racism against their opponents. (Solomons, 2009; Dippnall, 2009b). The developers do not appear to be blameless in the fomenting of these tensions. More than 6000 unemployed people who attended a meeting, invitations to which were broadcast from moving vehicles with loudhailers, were allegedly *all* (cynically some might say) promised jobs by the developers, while at that stage they (the developers) were, strictly speaking, only busy with a skills audit (Dippnall, 2009a).

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<sup>311</sup> See <http://guardiansgardenroute.blogspot.com/2011/02/February-2011-guardians-of-garden-route.html>. [Accessed on 12 December 2011].

One might conclude (maybe uncharitably) that the developers hoped that this demonstration of support from the poor and the unemployed would, in the light of the great need for socio-economic development in South Africa in general, and in the Southern Cape in particular, put their project in a favourable light with the authorities.

In other areas too the ethics of the developers' actions could be questioned. They incurred sanctions from the authorities when they proceeded with construction work before the necessary approvals had been granted, and as a result were ordered by the WCPG to reinstate and rehabilitate those areas where work had been done. However, even after a time span of some months, it appeared, that very little of the reinstatement had been done (Carew, 2004; Yeld, 2005).

Another matter of dubious ethics is highlighted in the *Rapid Review* report.

An issue that has been raised frequently is that golf estate developments are advertised and even provisionally sold (i.e. offer to purchase agreed) before approval has been granted by authorities in terms of environmental, planning and agricultural legislation ... Land owners and developers [may not only be] acting unlawfully when advertising their development or provisionally selling even before they have subdivision approval, ... [but] this is problematic as it places pressure on decision-makers to approve the development (due to the investment already made in promoting the project) and the public to not object to the development. (DEADP, 2005a: 79, 88)

It is evident that the LagoonBay developers have not paid much heed to this opinion, as they have gone ahead with advance sales, and have duly also complained about their losses in this regard, occasioned by the delays in the issuing of the requisite approvals (Muller, 2007).

Another controversial event in the history of the LagoonBay development was its approval by an outgoing member of the executive council (MEC) of the WCPG during his last days in office.<sup>312</sup> This occurred after the development had already been turned down by officials of the DEADP on the grounds of planning non-conformities, and agricultural, environmental and water availability issues. It is not improbable that politically connected individuals in the development team could have exerted some pressure on the MEC, as the GLF certainly did. Indeed the MEC used the socio-economic benefits associated with the development as a reason

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<sup>312</sup> The ruling party to which the MEC belonged had been voted out of office.

to justify his decision to override the negative assessment made by his officials. He furthermore claimed that there was “sufficient conformance” with the planning guidelines, that the agricultural land in question was degraded in any case, and that the George Municipality would supply waste water for the development. However, given the circumstances and timing of his decision, one cannot avoid a suspicion of political opportunism (Dippnall, 2008; Dippnall, 2009a; De Beer, 2009; Gosling, 2009).

A subsequent political decision on the LagoonBay development, which (temporarily) closed the door on this development, has fuelled even more controversy. In April 2011 the new MEC turned an application for the rezoning of the land concerned down. It was claimed that the rezoning permission was the last step needed in getting the project to go ahead, and the developers and the GLF were vehement in their criticism of the MEC’s decision, again threatening court action. The MEC did not, at the time, furnish reasons for his decision, but said that he would do so within the legal limit of 90 days – one would have thought that these reasons would have been readily at hand as they surely must all have been thoroughly considered before he made his decision (Oelofse, 2011a; Oelofse, 2011b; Schoonraad, 2011). The developers took their case to court, but the Western Cape High Court ruled in the MEC’s favour. However in March 2013, the Supreme Court of Appeal overruled this decision and cleared the way for the LagoonBay development to go ahead (Yeld, 2013). The matter has since been referred to the Constitutional Court, which has overturned the decision again, and thus for the moment it seems that the LagoonBay development will not happen (Rabinowitz, 2013).

#### **9.1.6 Can the disputes around the golfing estate developments in the Garden Route be resolved?**

Is the proliferation of golfing estate developments in the Garden Route sustainable? This is perhaps the most pertinent question one can ask around these developments, and it predicates the need for a sustainability guideline. Although not available at the time when some of the older golfing establishments were developed, there is now the *Guidelines for Golf Courses, Golf Estates, Polo Fields and Polo Estates in the Western Cape* (DEADP, 2005b), produced by the WCPG. So the question can now be rephrased as follows: is the establishment of a golfing estate in the Southern Cape that meets the WCPG’s guidelines sustainable? One must acknowledge that the guidelines go some considerable way in ensuring sustainability; they are,

for example, based on a conception of sustainable development that recognises its dimensional hierarchy (DEADP, 2005b: 6); they draw, *inter alia*, on the NEMA set of sustainability principles (DEADP, 2005b: 12-13); they also, on a practical level, suggest approaches that attempt to maintain long term sustainability. For example, as far as water use is concerned the following is said:

The specialist water resources study must determine whether the water demand for the development can be sustained in the long-term, using a 20-year time horizon, with no adverse effects on society, natural systems and agricultural resources. (DEADP, 2005b: 34-35)

The social and economic dimensions are also addressed in various ways, of which the following are two examples:

All golf courses, golf estates, polo fields and polo estates shall provide serviced land and top structures, to an approved subsidised housing scheme, where available, or to a fund set up for social housing, to provide for 10% social housing and 10% subsidy housing within the community concerned. (DEADP, 2005b: 41)

A complete economic impact assessment of the proposed development (not related to corporate social investment) will be required, including information on job creation, procurement, multipliers, and business models, based on at least a 10-year horizon. (DEADP, 2005b: 43)

If one must criticise these guidelines one negative aspect might be that they were not available from the beginning. They are also of course specifically focussed on golf course and similar developments, and not for development in general. Thus the need for a more broad ranging SEA seems to remain undiminished. It has been mentioned that non-availability of an SEA for the Garden Route is a governance omission. Reasons that can be put forward for this state of affairs could range from the lack of finance for such an assessment,<sup>313</sup> to the lack of time and expertise available for doing the assessment. Perhaps this is an important lesson: good environmental management requires the incorporation of SEAs as a standard procedure into the planning functions of the provincial and the national governments.

One might also argue that what is needed is an overall and primary policy of sustainable development,<sup>314</sup> together with what might be called a blueprint for sustainable development.

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<sup>313</sup> This is said in the light of the heavy demands placed on the fiscus to meet development and upliftment needs.

<sup>314</sup> The NFSD and NSSD1 arrived too late on the scene to be of any use here.

It has already been suggested that the PSDF could be a useful instrument in the latter regard. It not only provides depth in terms of vision, values and principles, but it also touches on applications. For example, of the applications mentioned in the PSDF (see Appendix F), ones that could be used in the sustainability assessment of golfing developments could be those of *multiple criteria decision analysis*<sup>315</sup> and *ecological footprinting*.<sup>316</sup> While the latter approach is aimed more at environmental issues, the former could address the difficult balance between economic realities, social needs and environmental protection. As regards the water issue an even more specific tool might be the *water footprint assessment*.<sup>317</sup> These tools, unlike the guidelines which have been mentioned previously, attempt actual sustainability assessments. EIAs also, while identifying environmental impacts and their significance, do not get down to the level of sustainability assessments, as a rule.

While these practical tools are useful it must be remembered that in the case of the LagoonBay development much of the conflict revolved around values. On this deeper level one can fall back on to the principles of sustainable development in order to get a better insight into what the value conflicts are about. Using the set of principles that has been incorporated into the PSDF, and the LagoonBay development as an example, one can attempt to illustrate how the values of certain role players, or their conception of sustainable development, to the extent that these can be determined from some of the actions they have committed or statements they have made, can be construed as being in accord with or against one or more of the principles. This is illustrated in Table 9.1, where a positive symbol (✓) indicates support for the principle in question, and a negative symbol (✗) indicates a disregard for the principle concerned.

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<sup>315</sup> Belton, V. & Stewart, T. J., 2002. *Multiple criteria decision analysis: An integrated approach*. Boston: Kluwer Academic Publishers.

<sup>316</sup> Wackernagel, M. & Rees, W. E., 1996. *Our ecological footprint. Reducing human impact on the earth*. Gabriola Island, Canada: New Society Publishers.

<sup>317</sup> Hoekstra, A. Y., et al., 2011. *The water footprint assessment manual*. London: Earthscan.

TABLE 9.1: VIEWS AND ACTIONS OF PARTIES IN THE LAGOONBAY DEVELOPMENT VS THE PRINCIPLES OF SUSTAINABLE DEVELOPMENT

Proposed Sustainable Development Principles	LagoonBay Development	
	Positive/negative*	Views or actions of parties
The holism principle	✗	Short term views held by most
The sustainable development principle	✗	Misapprehension of depth of sustainable development
The carrying capacity principle	✗	The issue of water use (for the region)
The conservation principle	✓	Eco-corridors, rehabilitation of degraded land, etc.
The precautionary principle	✗	Again maybe the water use issue
The minimum impact principle	✗ ✓	The size of the development (compared to most) Use of waste water
The fairness principle	✗ ✓	Indiscriminate offering of jobs to all The poor/unemployed sharing in benefits
The dignity principle	✗ ✓	Opposers vilified and threatened Housing for the poor
The participation principle	✓	Locals participating in Hoogekraal Trust
The empowerment principle	✓ ✓	Training and education for the poor Poor becoming agricultural producers
The responsibility principle	✗	Damage to societal cohesion
The efficiency principle	✗	Urban sprawl
The user pays principle	✗ ✗	Latent development costs (e.g. roads) carried by others Congestion 'costs' for neighbours
The democracy principle	✗	Threats of violence
The effective governance principle	✗ ✗	MEC and officials at cross purposes Political opportunism
The corporate responsibility principle	✓	The SDI initiative of the developer

\*Positive = ✓ and negative = ✗

The above table demonstrates that if all parties could agree on a set of sustainable development principles at least the source of much of the discord could be identified. This implies that an education initiative (on sustainable development) may need to be extended to all the role players. In all probability an outside facilitator could be employed in this role, and it will obviously be for the cost of the developer. As has been said, the technical issues (e.g. water use) can usually be resolved, one way or the other (for example, by using municipal waste water, as in the case of the LagoonBay development), but the more exacting discord usually revolves

around more deep-seated issues of principle or values. A possible approach towards resolving such a conflict of values, the *rational interaction for moral sensitivity* (RIMS) approach, has been proposed by Rossouw (2002: 72-79). While this strategy might appear somewhat idealistic, with goodwill from all sides it can increase the level of tolerance all round, and that in the long run could save time and the expense of litigation. According to Rossouw this approach

is a dialogue between two or more parties who have a stake in the moral issue under discussion. There are no other qualifications that participants have to meet. They have to be a stakeholder, and they have to be willing to discuss the issue in a rational and tolerant way. All partners must be capable of understanding the arguments. 'Rationality' in this sense allows for arguments in which values, culture, religion, and emotions are taken into consideration. Rational arguments of this type are the only valid means of persuasion permitted.

Tolerance is needed to respect one's partners in the dialogue as moral agents who have not only a stake, but also a valid contribution to make towards the resolution of the problem. Participants have to allow one another freedom to express their opinions as well as the opportunity for countering and criticizing these opinions. (2002: 76-77)

The RIMS approach consists of three basic steps – these are presented in Box 9.1.

<p><b>Step one:</b> Generate and evaluate arguments Any moral argument that satisfies the following three criteria should be taken into consideration in the decision-making process:</p> <ul style="list-style-type: none"><li>– The argument should take into consideration the interests of others, as well as your own.</li><li>– The argument should be clear and intelligible to all.</li><li>– The facts of the argument should be correct and logically coherent.</li></ul> <p><b>Step two:</b> Identify implications The focus should not be on participants' motives or moral convictions but should be on the positive and negative implications of the various arguments.</p> <p><b>Step three:</b> Find solutions</p>
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**BOX 9.1: THE RIMS APPROACH**  
(Rossouw, 2002: 77)

It is clear from the above that this approach requires some level of maturity and objectivity from the opposing parties. Given the degree of negative of interaction that has developed in the case of the LagoonBay development it is clear that if such an intervention is to have any benefit, it has to occur at the very early stages of the development, before attitudes become hardened, and emotions boil over. It goes without saying that the successful application of the RIMS approach

requires a facilitator of great skill and experience.

It must be recognised that a clash of values is not easily resolved because we all believe that our own values are justified. If all else fails the last resort for parties in dispute is the legal route. In the LagoonBay saga various parties have at times chosen this option. While courts have many disadvantages, such as the costs and time delays involved, they must also be treasured as the only way in which civilised societies can, in the final instance, resolve deadlocked disputes. In this regard democracies place a high premium upon the independence of the judiciary. As far as sustainable development is concerned, it is incumbent upon the authorities to put laws and policies in place which allow the courts to promote sustainable development, and transform the sustainability principles into jurisprudential principles.

At the deepest level some of the disputes around the golfing estate developments in the Garden Route touch on societal choices. For example, the positive economic impacts of golfing developments will probably resonate more with those who are inclined towards the free market dogma of economic growth. They would see economic growth as the driver of increased human welfare and environmental protection. Those of a more socialist orientation would tend to see human welfare in general (and maybe employment too) as human rights, which as such, should not have to rely on economic growth for their realisation; in the final instance they have to be guaranteed by government. The social choices people make are often influenced by their final position in society; in very simple terms, poor people favour rewarding jobs; rich people favour pleasing, crime-free environments. The arguments around crime are particularly pertinent to South Africa with its high crime rate, and the consequential threats to personal security. Some (usually the wealthy) argue that as a result of the government's failure to curb crime, they are forced to take their own measures towards ensuring their security, and these measures include restricted access residential precincts within golfing estates. It seems quite clear that societal choices lie at the bottom of many of the controversies around the golfing estate developments in the Garden Route, and that makes the resolution of these controversies all the more difficult.

A final comment on the societal issues that underlie not only golfing estate developments but development in general, revolves around the issue of human population pressure. In preceding discussions the feeling has emerged that there is a maximum number of golfing estates that can

be accommodated in the Garden Route (with some suggesting that there are already too many). But this type of question can, of course, be extended to other types of development too; and one could, for example, also think of an optimum area in the Garden Route to be reserved for agriculture, and similarly for forestry. Some argue that the Garden Route is over commercialised, thereby implying that there may be some kind of upper limit to the number of retail businesses that can be accommodated in the Garden Route. None of these questions are easy to answer, but that does not make them seem logically unreasonable. One could argue that the Garden Route SEA, that has been called for earlier in these discussions, would go some way towards fielding these questions. However the question of an upper limit to the number of people that can be supported in the Garden Route is never raised. Yet undoubtably, virtually all of the issues that have been mentioned here above, as well as those that have arisen around golfing developments can, in the final instance, be traced to human population pressures. Issues such as water use, environmental degradation, employment needs, agricultural land requirements, recreational wants, etc., are all ultimately driven by human numbers. Does anyone doubt that vast numbers of people in the Garden Route will overwhelm the available opportunities, and destroy many of the natural attributes that are the attractions of this region? While the idea of carrying capacity is used readily in relation to farms and game parks, it is not used in terms of human numbers,<sup>318</sup> particularly not by government agencies. Population control is a highly emotive issue, and one which most politicians steer clear of – yet can one avoid the conclusion that human population pressure is a fundamental factor that underlies most, if not all, sustainable development capacity considerations? Human pressure could turn the Garden Route, for all its beauty and natural charm, into an area of wall-to-wall development, and there are signs that this may be in the process of happening. Human numbers mirror societal choices, and the way we react to the human population increase, is also a societal choice. Admittedly making a choice about human numbers is a very difficult one, but to simply ignore the question does not mean that we have not made a choice.

Engineers who are involved in the layout and construction of golfing estates have an unenviable task, particularly when these developments are contested to the degree that they are in the Garden Route. And when such contestations are reflective of societal choices, engineers are indeed in a predicament of some magnitude. So it is to the relationship between golfing estate

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<sup>318</sup> Does this situation not reflect the anthropocentric split between humans and the rest of nature?

developments and civil engineering practice that attention is turned next.

### **9.1.7 Golfing estate developments and civil engineering**

The discussion thus far on the problems around golfing estate developments has confirmed the important link between these problems and societal choices, a link it seems which is more fundamental than the engineering culpability (by association) in these problems.<sup>319</sup> But civil engineers cannot use this as an excuse for not taking serious cognisance of the role that they play in these developments, particularly with respect to sustainability. While it should be quite evident from what has been said thus far that engineers are not principal players in the conflicts spawned by these developments, it is clear that they, or least their activities, are often the public face of these developments, particularly during the construction phase. It also follows that as engineers are employed by developers in order to turn the developers' ideas and plans into reality, that they, the engineers, inevitably find themselves grouped with those who support the development, and by extension in confrontation with those who oppose it. Being thus committed to the development, they nevertheless can still use their skills and experience to introduce ways of implementation that are less harmful to the environment, that are more efficient and are more durable, and that are, in short, more sustainable. However, in the final instance, as the golfing project implementation agents, engineers cannot avoid, for good or bad, in sharing some culpability. Short of withdrawing from the project altogether, they are professionally tied to it, and its impacts and consequences.

In a free market system, the engineer carries out the bidding of his or her client (the developer), as this is the way in which he or she earns an income. In theory this need not, from a sustainability point of view, be a problem; the project, at its point of physical implementation, should already have undergone an EIA, a process which ostensibly clarifies and resolves all the contentious (environmental, broadly speaking) issues. In practice this is not always the case; some projects remain, despite the EIA and subsequent environmental authorisation,

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<sup>319</sup> It is not the intention in this study to present a comprehensive critique of (civil) engineering practice, but rather the focus is on what *needs* to be done to orient this practice more towards sustainability. No doubt there is much being done in engineering practice at present that is commendable, but on the whole sustainability still remains unrealised. It must also be mentioned that the good intentions of engineers are not infrequently thwarted and overridden by political decisions.

controversial and suspect from a sustainability point of view.<sup>320</sup> And so, as has been said, engineers become tainted, so to speak, by their association with these controversial projects. Another problem, particularly applicable to the environmental assessment practitioner (EAP), also becomes relevant to engineering companies when they, having extended their expertise into the field of environmental assessment, fulfil the role of an EAP. The EAP is the consultant who carries out the EIA on behalf of the developer. In this role the EAP is legally required to be independent by not entertaining any bias or interest in favour of the project.<sup>321</sup> The problem is that the EAP is directly employed (and paid) by the developer, and that in this relationship he or she is thus unavoidably under pressure to produce a favourable assessment. It stands to reason that developers will not readily employ EAPs who consistently produce assessments that do not earn environmental authorisations. Ideally the EAP should be appointed by an independent agency. The developer then pays the agency, and it is the agency that selects and contractually employs the EAP to do the EIA. However this is not the situation at present, and the practice of the developer employing the EAP prevails. The negative impact of this unfortunate arrangement may be alleviated, to some extent, by the latest move to have the competency of EAPs formally certified.

Returning to engineers operating in their more traditional engineering role; it is a role in which, as has been explained, they quite often, by default, seem to be promoting projects that are environmentally questionable or of dubious sustainability merit. In such situations it is a lot to expect of engineers to turn down their involvement in these projects (and hence forgo their commissions), simply because the projects appear to be suspect from an environmental or a sustainability point of view. Engineers, after all, make their living through commissions, and furthermore they could argue that with their continued involvement with the project, they can at least ensure that the negative aspects of the project are ameliorated. Moreover, in a free market system, there is no guarantee if one engineering company turns down a commission, that it will not be snapped up by the next. (This situation points to the need for a professional code of sustainability ethics, a topic that will be taken up later in this study.)

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<sup>320</sup> And many, in any case, doubt that an EIA is a guarantee of sustainability.

<sup>321</sup> Of course if an engineering company performs the role of an EAP, it cannot be involved in the subsequent construction of the project, as that would compromise the legally required independence of the EAP. (See the next case study in this regard.)

Another issue in terms of which engineers face a difficult choice with regard to good environmental/sustainability practice *vis-a-vis* their own commercial interest, is the issue of the size of a project. Generally it may be assumed that bigger projects produce greater environmental impacts, with worse sustainability prospects. Now, when the remuneration of engineers is commensurate with the size of the project, as it often is, it is clear that they do not have an incentive, at least not a financial one, to reduce the size of the project.<sup>322</sup> In more general terms the problem can be stated as follows: engineers, particularly civil engineers, make a living from designing and constructing physical infrastructure – the more the better. In contrast environmental constraints and sustainability precepts often predicate a more conservative approach; in the words of Schumacher, “Small is beautiful” (1993). This is not to say that all civil engineers pursue their financial interests ruthlessly, but rather that there seems to be a built-in clash between what civil engineers may deem to be in their financial interest, and what some might claim to be their ethical obligations to the environment. This begs the question of how this clash can be resolved – and so it is to this theme that this study will later return, when a professional code of sustainability ethics will become the topic of discussion.

Now on to the next sub-section where another case study will be discussed. Here even more situations that, from sustainability and ethical perspectives, are problematic for engineers will come to light.

## 9.2 THE N2 TOLL ROAD THROUGH THE WILD COAST

In this case study the main role players are engineers, but obviously there are other parties as well. These include a mix of professionals and laypersons, government officials and NGOs, environmentalists and traditional communities, and so it is not surprising that there are many clashing viewpoints. As such the N2 Toll Road is as good an example as any of the so-called environmental dilemma, but also it is quite appropriate for this study as engineers play such a prominent role.

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<sup>322</sup> Of course the size of a project is not normally the engineer’s prerogative, but certainly he or she can make recommendations in this regard.

### 9.2.1 Description and history of the project

As the existing national road route between East London in the Eastern Cape Province and Durban in KwaZulu-Natal has been in use for a number of years it is in need of upgrading and rehabilitation. The South African National Roads Agency Limited (SANRAL) is responsible for the maintenance and construction of all National Roads within South Africa. The expense involved in the maintenance and construction of major roads, and budget constraints, has led SANRAL to adopt a policy of *unsolicited proposals* through which

the private sector can participate in the development, operation and maintenance of National Road infrastructure for a specified period (a Concession Period), provide finance for this purpose, and make a return on their investment by charging road-users a toll. When the Concession Period expires the infrastructure reverts back to the State, in this case, SANRAL. (Bohlweki, *et al.*, 2003: 5)

In the year 2000 a number of, *inter alia*, engineering companies, formed a consortium, named the Wild Coast Consortium (WCC), in order to submit, in line with the above mentioned policy, an unsolicited proposal to SANRAL for the financing, design, construction, operation and maintenance of the so-called N2 Wild Coast Toll Road (WCTR) between East London and Durban. Covering a total distance of some 550 km, approximately 80 % of the route follows an existing road alignment, while the remaining 20 % is a completely new road. The alignment of this latter section of road was investigated through a so-called 'greenfields' corridor.<sup>323</sup> (See Figure 1.1 in Appendix J.) This proposed WCTR is shorter than the existing road link between East London and Durban by about 85 km. In addition the new route would also offer an improved and safer alignment thereby reducing transport costs. The Wild Coast area through which the new route passes includes a region traditionally known as Pondoland, and it is also an area of great natural beauty and botanical value. The Pondoland area is what some might call a rural backwater as it has not benefited much by way of development. It is claimed that the WCTR would unlock the development potential of this region, and bring greater economic opportunities to the people of the area. In summary, the shorter, more efficient route was viewed not only as an improvement to the national transport network, but also as of strategic importance to the region and the country as a whole (Bohlweki, *et al.*, 2003: 1-7).

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<sup>323</sup> The 'greenfields' corridor refers to a piece of undeveloped land of a specified width that more or less follows the proposed new route. The alignment of the new road will be fitted into this corridor.

It is mandatory for all projects of this nature and magnitude to undergo an EIA, and in the case of the WCTR the final EIA report was duly completed in 2003 (Bohlweki, *et al.*, 2003) and submitted to the then Department of Environmental Affairs and Tourism (DEAT). In December 2003 the Director-General of DEAT issued a record of decision (RoD) in favour of the proposed road (DEAT, 2003). There were many objections against this decision on various grounds, which included the timing of the release of the RoD. It was released on 3 December 2003, which meant that the 30 day appeal period fell directly over the Christmas holiday season, an obviously less than ideal period for interested parties to organise their responses to the RoD. The validity of this complaint was implicitly admitted when, at a later stage, an extension of time for the submission of appeals, was granted. Other complaints that surfaced during this period were that construction activities appeared to have started prematurely, and that DEAT, SANRAL and politicians had shown little respect for the appeal process by going ahead in this period with public campaigns in favour of the WCTR, stating, *inter alia*, that the toll road *would* be going ahead irrespective, and also by belittling opponents to the road project (WESSA 2003d; Rogers, 2004: 44, 49; WESSA, 2004a; WESSA, 2004b). Objections were received from many sources which included NGOs, churches, businesses, individuals and even a government department (WESSA, 2003d; NECCSA, 2004; Carnie, 2004). It needs to be noted that many of the objections against the WCTR acknowledged the need for improved infrastructure in the Pondoland area, and also the need for upgrading the existing N2 road, but it was mainly the preferred (by the developers) route location of the proposed WCTR, and the inappropriateness of a toll road as a vehicle of upliftment, that were the issues of contention. However when, in December 2004, the (new) Minister of Environmental Affairs rescinded the earlier decision approving the WCTR, this was not done on the merit of these objections, but on the grounds of a procedural irregularity; the EIA practitioner failed to meet the mandatory requirement of independence, as there were shareholdings and directorships in common between the environmental consultancy that did the EIA and the WCC (DEAT, 2004b). It is interesting to note that when this problem was earlier pointed out to SANRAL, it was “brushed ... aside as being of no consequence, ... [and] irrelevant since it was SANRAL who commissioned the EIA and not the bidding companies” (WESSA, 2004e: 5).

In rescinding the RoD, the Minister did not, however, exclude the possibility of a re-submission of an application for environmental authorisation, and indeed this is what happened. Under the

hand of a new environmental consultant, and in the name of SANRAL (instead of the WCC) as the developer, another EIA was conducted. The report was duly completed in December 2009, and in April 2010 another RoD in favour of the development was issued by DEAT. As usual interested and affected parties were allowed to appeal this new RoD, and again there were numerous objections. However in July 2011 the Minister dismissed these appeals and granted final approval for the construction of the WCTR (DWEA, 2011). From the latest press reports it appears that SANRAL might be having second thoughts about the project (or aspects of it) (Mbanjwa, 2013; Carnie, 2013).

### **9.2.2 The Pondoland Centre of Endemism**

A major concern of the environmentalists is the danger that the proposed WCTR poses to the so-called Pondoland Centre of Endemism (PCE), which is part of the

Maputaland-Pondoland-Albany 'hotspot' – one of three hotspots in South Africa of a total of 34 globally. 'Hotspots' are characterised by both exceptional levels of plant endemism and by serious levels of habitat loss. ... The Maputaland-Pondoland-Albany is also listed ... [amongst others] as having the least amount of its total area under formal protection (Galliers, 2010: 15).

The Pondoland Centre of Endemism contains at least 196 endemic plants, and in the small Umtamvuna Nature Reserve located in the PCE area more than 1400 plant species have been identified. This compares to a similar number of species in the Kruger National Park, 600 times larger, and again a similar number in the whole of the United Kingdom (Galliers, 2010: 15). In the time since the WCTR project has become a firm proposal, the species richness of this area has, on several occasions, been reconfirmed by the discovery of new and rare plant and animal species in, or close to, the path of the proposed route of the toll road (WESSA, 2003b; Smith, 2009).

Environmentalists, including the Wildlife and Environment Society of South Africa (WESSA), have long campaigned for a more formal recognition of the conservation worthy status of the Wild Coast. Some smaller reserves have been proclaimed and also a Marine Protected Area off the Pondoland coast, but the ideal is for them all to be consolidated in a single Biosphere Reserve or a World Heritage Site (Cooper, 2010: 18). There were great expectations when the Minister of Environmental Affairs announced the establishment, in principle, of a National Park

in the Pondoland area in 2005, but thus far these expectations remain unfulfilled as there have, as yet, been no formal developments in this regard. Although a DEAT investigation is said to have indicated that the local inhabitants were not entirely happy with a park (Bennie, 2010: 128), it might not be unreasonable to suggest that the uncertainty around the WCTR and the proposed mining at Xolobeni (see next sub-section), have also contributed to the delay in the formal establishment of the park. There has been evidence to suggest that officials and politicians might have their own agendas in support of the WCTR and the Xolobeni mining, and if that is the case, a national park in this area might just thwart their aspirations in this regard (Clarke, 2012). While the developers have claimed that the WCTR and the proposed Pondoland Park are mutually compatible, it nevertheless still does seem highly inappropriate for a toll highway to run through a national park, or for mining to take place in a conservation area.

### **9.2.3 Mining on the Wild Coast**

While the proposed mining at Xolobeni is not (officially) part of the WCTR project, there appear to be strong potential links, and hence it is not considered inappropriate to expand somewhat in this sub-section on the possible Xolobeni-WCTR links, and indeed on the proposed mining itself.

The Xolobeni mining issues, which has featured much more strongly during the period of the second EIA of the WCTR, arise from the matter of dune mining for heavy minerals along a coastal stretch in the north of Pondoland. This proposed mining operation is known as the *Xolobeni Mineral Sands Project*, and it apparently will involve large scale earth movement, wet separation of materials on site, and then the transport of the mined minerals in large trucks to East London for further treatment. Obviously this mass movement of material will require a high quality road along the shortest possible route. There is a belief amongst many that this need may be a major motivation behind the SANRAL preferred location the WCTR, passing as it does, within close proximity of the proposed mining area. Initially the mining project was based on prospecting rights which had been granted to *Transworld Energy and Mineral Resources (S.A.) Pty Ltd* (TEM), the South African subsidiary of an Australian mining

company, *Mineral Commodities Ltd* (MRC).<sup>324</sup> In 2008 the Department of Mineral Resources (DMR) granted mining rights to TEM, but in a secretive way, as local affected parties only became aware of this decision when it was reported on the Australian Stock Exchange website, about three weeks after the decision was taken by DMR (Bennie, 2010: 98, 108, De Wet, 2011; no page number; Sephton, 2008: 6-8).

While the link between the mining project and the WCTR has been denied by DEAT and SANRAL (Wray, 2003; News 24, 2003b), it has subsequently come to light, following an application under the Promotion of Access to Information Act by the legal representative of various communities in the Pondoland area, that the terms of reference issued by SANRAL to the environmental consultants appointed to do the EIA on the WCTR, specifically instructs them to motivate the exclusion of the current R61 and N2 routes (see Figure 1.1 in Appendix J), which are more remote from the proposed mining operation. The legal representative concludes that the reason for this instruction could be linked to the viability of the proposed Xolobeni mining, which would decrease considerably if the more proximate, SANRAL preferred route was not available to be used (Salgado, 2011). It has also been suggested that the mining group applied for registration as an interested and affected party in the WCTR EIA in order to exert a positive (from the perspective of the mining operation) influence on the location of the WCTR (Clarke, 2010a).

Complaints against the mining company include accusations that the community were never given opportunities to discuss the alternatives to mining, or the social and environmental impacts of mining. As a counter TEM has involved (and sponsored) a black empowerment partner, *Xolobeni Community Empowerment Company* (XolCo), which it claims represents the Amadiba community (GCS, 2007: 1). XolCo, unsurprisingly supports the mining development, but claims that it is unrepresentative of the community, and that it has been involved in fraud and coercion, have been made from various quarters. Division has been sown in the local community between those who support mining and those who wish to maintain their traditional lifestyles and who in general support eco-tourism projects for the area. The latter group have formed the *Amadiba Crisis Committee* (ACC) to represent their interests. This potentially

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<sup>324</sup> MRC appears to be a company of only limited mining experience, and the operations of which are somewhat questionable (Schutze, 2007: 4-5).

violent situation is caused, it is claimed, by the “divisive and destructive conduct” of the mining cohorts, and they have been accused of “bribery, corruption and even murder” (Rodgers, 2006: 10; De Wet 2011: no page number). In order to create the impression of community support, it is claimed that XolCo has produced sworn affidavits containing “long lists of local residents whose signatures had been forged and many of whom were long deceased, all stating they were in ‘full agreement with the mining project going ahead’” (Clarke, 2010b; Bennie, 2010: 138).

The ACC have involved the *Legal Resources Centre* (LRC, a South African human rights organization) as their legal representative. In formulating its appeal on behalf of the ACC against the granting of the mining licence the LRC highlights the lack of consultation with the community:

The public consultation process ... was fatally flawed because

- there was insufficient notice of public meetings held;
- the members of the Xolobeni community were not properly consulted;
- inaccurate or incomplete information was provided to the community;
- not all aspects that required to be addressed with the affected community were raised or addressed;
- XolCo does not represent the community. (Sephton, 2008: 11; [paragraph numbers omitted])

In addition the LRC mentions no less than nineteen other negative impacts which would result from the mining and which would prejudice the community. These include eviction from and loss of access to their land, the risk to their groundwater sources, the negative impacts such as noise, heavy traffic<sup>325</sup> and dust arising from the mining operation, increase in unwanted pregnancies, sexually transmitted diseases and crime due to the influx of workers, and the loss of eco-tourism opportunities in the area (Sephton, 2008: 4-5). While

MRC and its local subsidiary, ... TEM, are punting titanium mining as the panacea for poverty and unemployment in the region, ... an independent assessment compiled in 2005 ... reveals that the benefits from mining and nature-based tourism are virtually identical. The difference then lies in social and environmental impacts, where nature-based tourism is a clear winner (Schutze, 2007: 1).

The granting of the mining licence to TEM has also been severely criticised by the LRC on the grounds of the Department of Minerals and Energy (DME) having

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<sup>325</sup> The traffic generated by the mine is estimated at “64 trucks per day, making 2.7 trips per hour, 24 hours a day, 7 days a week for the lifetime of the mine” (Sephton: 2008: 4).

failed to co-operate with other departments as required, blatantly ignored objections to the proposed mining project and failed entirely to implement its own statutory requirements for the issuing of mining licences. (Carlisle, 2010)

In addition the LRC has also accused TEM of having failed to provide “proof of its technical and financial ability to mitigate and rehabilitate relevant environmental impacts” and of not having submitted other information as requested from it by DME (Carlisle, 2010).

It appears that the reality of at least some of these flaws, and the threatened court action by the ACC (through the LRC) has led the Minister (of the DMR), in May 2011, to declare the previously granted mining right to TEM withdrawn. Although the Minister made a point of not impugning TEM’s interaction with interested and affected parties, she did point out unfulfilled obligations and requirements by TEM, and granted the mining company a period of 90 days in which to address the said shortcomings (DMR, 2011). Subsequently the mining companies have re-applied for prospecting rights, and this has, in turn, again raised the voices of protest and produced new accusations of corruption (Macleod, 2013), but it appears that these rights have not been granted as of yet.

#### **9.2.4 Other problems around the proposed Wild Coast toll road**

Apart from the mining link, the complaints against the WCTR that emerged during the EIA processes, were wide ranging, both in terms of content and source. As one would expect environmental NGOs were in the forefront of the campaign against the WCTR, but many other community based organisations, business groupings and individuals, including the amaPondo King and Queen, have all at different times objected to the project or components of the project (News 24, 2003a; News 24, 2003b; DEAT, 2004b). In the final EIA report it is recognised that over 7000 people were strongly opposed to the toll plan (Carnie, 2010). Clarke lists the following complainants:

- The local Amadiba community who stand to be most significantly affected by the road, and fear that it will render coastal dune mining inevitable.
- South Coast residents who object to having heavy loaded toll fees that South Coast commuters to Durban will be expected to pay to cross subsidize the construction of the Greenfields section through the Eastern Cape.
- Many members of Sustaining the Wild Coast objected in their individual capacities to the failure to consider alternative alignments, the overall failure to

assess the road impacts in relation to the cumulative impacts of other proposed developments, notably the Xolobeni mining venture, and to poor public participation methods.

- Southern African Faith Communities Environment Institute (Bishop Geoff Davies) objected again to the failure to seriously consider alternative alignments, and to the artificiality of an administrative separation of the EIA procedures from the Intent to toll procedure, which will only ensue after the road is approved.
- WESSA and other environmental NGOs focussed on the threat to biodiversity in the Pondoland Centre of Endemism by these developments, in contravention of the Convention of Biological Diversity. (2010b)

The Amadiba community obtained legal assistance to present their objections, which, *inter alia*, revolved around the public consultation process; they felt it had “failed to meet even the very basic requirements” (Clarke, 2010b). The validity of this complaint may be supported by the fact that in 2004 the then Minister of Environmental Affairs apologised to King and Queen Mpondombini-Sigcau (of the amaPondo) for being “left out of the consultation loop with respect to the N2 Toll Road and the Xolobeni Mining” (WESSA, 2004c). It appears that the royals have in general opposed the WCTR and the Xolobeni mining. Rather fortuitously then for the toll road/mining lobby it would seem, a dispute around the rightful heir within the amaPondo royal family, has recently led to King Mpondombini-Sigcau being dislodged by the Commission for Traditional Leadership, as not being the rightful heir to the kingship. Some felt that this development may have been a payoff against the consistent opposition of the royals to the toll road and the mining (Salgado, 2011).

While the proposed WCTR would have obvious advantages for the Xolobeni mining operation, and might benefit, to a lesser degree, development in the Pondoland area, the implications it holds for the Durban and KwaZulu-Natal commuters, are generally viewed negatively. Many of these commuters would need to make daily use of that section of the route that makes up the northern end of the WCTR, and hence will be subjected to toll fees. Because of the heavy traffic generated in the Durban and South Coast area, these commuters feel that they are being targeted to carry a large part of the financial burden of this road, while the benefits of the road, as being championed by its proponents, will accrue mostly in the Wild Coast area. (Carnie, 2004; Cole, 2008). Feelings in this matter were running so high that a court order to stop the road was being considered (Nair, 2010). The final EIA report does acknowledge that the dropping of the price

of the toll fees for KwaZulu-Natal commuters and businesses would make the project more acceptable. It now appears that, in the face of this strong opposition to the WCTR in KwaZulu-Natal, the Minister of Transport may even consider the removal of the tolling component entirely from the project (Carnie, 2010; Carnie, 2011).

An issue that features prominently in the WCTR debate is the locality of its alignment, particularly that part of it that traverses the so-called 'greenfields' section. The complaint is generally that not enough effort has been put into investigating alternative alignments,<sup>326</sup> which, as has been mentioned, goes hand-in-hand with the accusation that the SANRAL preferred route was, apart from the reasons given in public, selected implicitly for the benefit of mining operations in the Xolobeni area. Associated with the alignment argument is the debate around the capacity of the WCTR to contribute to the development of the local community. Obviously SANRAL, and those in favour of the road, claim that it will contribute significantly to the development of the Pondoland area by opening up access to this area. The counter arguments are that the routing of a double highway through areas of great natural beauty and wealth, will in effect destroy the attraction of this heritage, which otherwise could serve as a basis for eco-tourism in the area, the economic benefits of which could, for the local community, far outlast those brought about by the highway. If one can make the assumption that a prime objective of the road is to create development opportunities for the local communities, it is hard to see how a fast speed, limited access highway can compete with an upgrading of the existing N2 and R61 routes in terms of direct benefit to the local communities. The South African Council of Churches has been reported as saying:

While fully supporting the government's commitment to overcome poverty, with regard to the proposed N2 toll road this Central Committee of the South African Council of Churches resolves to ask the government to upgrade the existing routes through the Eastern Cape – which we believe is the request of the local communities – rather than allowing the Wild Coast Consortium's proposed route through the "greenfields" section of Pondoland. (WESSA, 2003c)

Yet in the Final EIA Report it is stated that:

Along the section between Mthatha and the Mthamvuna River, despite the anticipated negative impacts associated with development in greenfields areas, the overwhelming opinions of people consulted was a need for greater access into the

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<sup>326</sup> See §9.2.5 for a fuller discussion on the consideration of alternative alignments.

area<sup>327</sup> [footnote added]. Reasons given for this varied from a need to ease the burden of travel into and out of the area, providing better access to health and other services and the creation of jobs. (CCA, 2009: xxxi)

It has also been suggested that not enough emphasis has been placed on the negative social impacts that will be inflicted on the towns and settlements along the existing R61 and N2 routes where the WCTR, in its preferred alignment, would bypass them – the spectre of them turning into ghost towns is feared. These towns include Kokstad, Harding, Mount Frere, Qumbu and Mount Ayliff. The Final EIA Report (EIR) merely rates these impacts as being of "medium" significance (CCA, 2009: xxxiii).

### 9.2.5 Alternative alignments

It has already been mentioned that the opponents of the WCTR are often cast as being against the road and development of the area *per se* (The Herald, 2003: 4), but in many instances, the opposition is rather against the *locality* of the road, and against the negative implications that the SANRAL preferred locality holds for the development of eco-tourism in the area. While the issue of whether a *toll highway* can do much for the upliftment of the Pondoland people is debatable, the fact that an improved *road infrastructure* in the area can do much for the development of region is not. These different perspectives were clearly brought to light in a workshop held by the interested parties to discuss alternative alignments for the toll road (NMA, 2006).

The Draft Scoping Report (DSR) produced by the environmental consultants dealt with a number of alternative alignments, particularly as regards the route section between Lusikisiki and Mthamvuna River (CCA, 2007: Chapter 5), which is the 'greenfields' section around which most of the route location controversy arises. Amongst these alternatives there is one which is the alignment preferred by SANRAL, and it is identified as such. Of the other alternative alignments in the DSR, most do not differ dramatically from the so-called SANRAL preferred route, and they all, to a larger or lesser degree, pass through the PCE and the proposed

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<sup>327</sup> This does not necessarily translate into support for the proposed toll highway as such.

Pondoland Park.<sup>328</sup> However, after the release of the DSR, the comments and feedback received revealed a strong desire for the consideration of yet other alternative alignments beyond those discussed in the DSR. This gave rise to the workshop referred to above, and as a result of this workshop a number of additional alignments were included in the scoping process. The Final Scoping Report (FSR) does indeed consider these additional alternative alignments,<sup>329</sup> but they are then all (without much ado some might feel) discarded as not being feasible, mostly on the grounds of being economically far more unfavourable than the preferred SANRAL route (CCA, 2007: Chapter 5).

It will not be feasible to cover all the detail around the consideration of the alternative routes here, but instead comment will be restricted to some general observations.

(a) The problem of underlying values

It appears that a computer program which was available to the SANRAL engineers, was used to quantify, *inter alia*, the economic implications of the route alternatives. Based on the input of data and various criteria, at least a few of which require some subjective judgement, the program identifies the most practical, shortest and cheapest routes. For example certain 'no go' areas can be defined which will ensure that the program will not consider a route that goes through these areas (NMA, 2006: 2). The fact that the SANRAL preferred route passes through the PCE and the proposed Pondoland Park shows that these areas were not chosen as 'no go' areas (CCA, 2007: Figure 5.8). This may be taken to reflect a value orientation which favours efficiency and economic considerations above those that seek to preserve the integrity of the natural environment. One may then reasonably assume that this value orientation is not unacceptable to the project designers. But moreover, as the environmental consultants involved in this project did not appear to raise objections to this particular use of the computer programme, or at least point out its implications, may one assume that they also, either consciously or subconsciously, endorsed the said value orientation?

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<sup>328</sup> The exceptions here are the so-called "do nothing" alternative, which is simply used as a base against which the other alternatives can be assessed, and then the upgrading of the existing N2 and R61 routes.

<sup>329</sup> The alternative route alignments are shown in Figures 5.1 and 5.3 of the FSR, and they are reproduced in Appendix J.

(b) The problem of mensuration across dimensions

In assessing the various route alignments, a problem that crops up in nearly every EIA, becomes clearly very evident here too. This is the problem of the incompatibility between the various measures of assessment that are made within the domains of the economic, social and natural environments. In the FSR and the EIR the environmental or social impacts “are rated on a nominal scale of low, medium, high or very high potential risk”, and the economic impact in terms of net present value, benefit-cost ratio and internal rate of return (CCA, 2007: 5-3). One may thus ask, if, for example, an alternative alignment has a high environmental impact and at the same time a high benefit-cost ratio, which measure weighs more? Must this alternative be discarded because of its high environmental impact or accepted because of its high benefit-cost ratio? One may be excused for getting the feeling that in the FSR it is the cost considerations which weigh more heavily; the only two alternatives of the many possible route locations discussed in the FSR to (effectively) go through for consideration in the full EIA, are the two that have the most favourable economic assessments, but then also have (mostly) high environmental impacts (CCA, 2007: 5-16).

(c) The problem of mensuration within a dimension

Not only is the assessment compatibility *across* dimensions problematic but also the commensurability *within* dimensions. For example, when does an environmental or social impact change from medium to high, etc? These problems, drawn from the WCTR assessments, are common to many EIAs, and it is seldom clear how such dilemmas can be resolved. But it might be argued that if the sustainable development paradigm is the point of departure, then it might, in these problematic circumstances, be appropriate to draw upon other principles of this paradigm, such as the precautionary principle, for example. This means that the ‘high’ impacts which are less quantifiable, should not in general be underrated when compared to ‘high’ impacts about which there is more certainty. Some will conclude that the arguments put forward in favour of the SANRAL preferred route of the WCTR reflect an underrating of the less quantifiable value of the PCE, which in any case is an evolving value in that new species are still periodically being discovered in the area (Smith, 2009).

(d) The problem of the bridge costs on some alternative routes

A last observation around the selection of alternative alignments discussed in the FSR, deals with a disadvantage ascribed to most of the alternatives suggested by the interested and affected parties; that is the high cost of the bridges that are considered necessary for some of these routes. Most of these routes are inland of the SANRAL preferred route, where their river crossings could involve relatively large bridges over rather deep gorges. As a general rule, the hydraulic capacity required of a bridge across a river should decrease if the location of the crossing is moved upstream,<sup>330</sup> and as a result the cost of upstream bridges should be less than downstream bridges, unless the topographical conditions dictate otherwise.<sup>331</sup> Thus in the case of the suggested alternative WCTR alignments, one may assume that the size of their bridges are determined more by vertical alignment considerations than by hydraulic considerations. While it appears that the location of these bridges have been determined by computer modelling, it may be argued that on-site inspections would have revealed, by overcoming the inaccuracies of scale in the computer models, cheaper solutions.<sup>332</sup> Furthermore, as there may only be one or two very costly bridges on such an alternative route, one may argue that with a relaxation of the vertical alignment standard over these relatively short sections, considerably more favourable 'cost' comparisons with the preferred SANRAL route may be obtained. The question then becomes one of weighing up the better *environmental* performance of the alternative route, against the increased *road user costs and discomfort* occasioned by the relaxed vertical alignment standards, over the short sections where the bridges occur. In the final instance this is again a value judgement, and the question then revolves around which values should prevail; is it either more road user costs, or increased environmental 'costs'.

In concluding this discussion on the arguments around the alternative alignments of the WCTR, one may make mention of a general problem that occurs in many EIAs where alternatives are compared. In much of current EIA practice significant amounts of the requisite base information, technical and economic, is supplied by the developer. Both the EAP and the

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<sup>330</sup> The catchment area becomes smaller upstream.

<sup>331</sup> Of course it may be possible that more bridges are needed upstream because of the densification of the stream network, but they should all be smaller.

<sup>332</sup> It appears as if the engineers relied on computer modelling to cost the alternative routes.

interested parties do not normally have the time nor the expertise to independently verify this information or to provide comparable levels of information where it is needed in support of their preferences. For these reasons it may be that in the case of the WCTR, the proposed alternatives were not as well researched as the SANRAL preferred route. This is not to suggest that developers are unscrupulous, but simply to acknowledge that while it would be natural for them to expend more resources on the option that they prefer, this may not necessarily be the best one from a sustainability point of view.

While not suggesting that, as a rule, developers are unscrupulous, it remains true that individuals may be. Role players in development activities, whether they be developers or not, try to promote their causes. In the process they may commit actions which are ethically controversial, or in worst cases even unequivocally immoral.

### **9.2.6 Controversial actions by the main role players**

During the extended EIA processes of the WCTR, the actions of DEAT have, on occasions, come under fire, *inter alia*, for being less than impartial in terms of its role as adjudicator. Perhaps the most obvious failure of DEAT in this regard is the approval granted in favour of the WCTR in the first RoD of December 2003, which overlooked the compromised independence of the environmental consultancy through its links with the developer consortium. This shortcoming may have been pointed out by the appeals lodged against the RoD, but one would have thought that it should have been identified early on by DEAT, given their prescribed oversight role with respect to mandatory requirements. Less obvious and perhaps more disputable is the appointment of the reviewer of the EIA, where it was pointed out that the reviewer had, through his previous utterances, shown a disregard for the environment. It is contended that the reviewer had, at “the height of the dune-mining debate ... argued [*inter alia*] that open-pit mining at St Lucia could be ‘an ecotourist money-spinner’ for thousands of visitors” (WESSA, 2003a). Objectors of the WCTR insisted that there was an obligation on DEAT to appoint an unbiased reviewer of the EIA. The fact that 80 % of the appeals dealt with matters of process and legal issues (DEAT, 2004b, Appendix: 5) underlines the importance of the above mentioned oversight role of DEAT (or DEA).

SANRAL, as one might suspect from a quick review of its mandate, has adopted a very strong stance in favour of the WCTR. On the other hand, as an agency of a government that espouses the principles of sustainable development, a more balanced approach might be appropriate. Notwithstanding this latter observation, it has in fact been reported that complaints were raised against SANRAL for aggressively promoting the WCTR in advertorials it placed in the national press, and for downplaying the negative aspects of this project. In fact, these complaints about the misleading advertising were upheld by the Advertising Standards Authority (WESSA, 2004d; Payn, *et al.*, 2005:4). This biased approach by SANRAL has been critically analysed by Farrington and Davies (2004). They conclude:

On the surface, the discourse in the [SANRAL advertorial] text reviewed was open and accessible but, through application of various narrative and discourse analysis techniques, we have uncovered some ‘evidence’ of SANRAL’s hidden messages and corporate PR, self-congratulatory and politically correct discourse. At a time when South Africa is committed to economic ‘progress’ and ‘growth’ at almost any cost, we need to be constantly wary of projects that are promoted in the media under the guise of sustainable development. Closer and critical inspection may reveal that these projects represent veiled corporate PR attempts at ‘letting the other fellow have your own way’. (2004: 172)

It has also been reported that the CEO of SANRAL promised that the secondary roads of the Pondoland area would also be upgraded, but only on condition that the WCTR was approved (Payn, *et al.*, 2005:3). This conditional promise of a service, that some would argue should be rendered in any case, is not what one would expect from an organisation operating in the public service arena.

### **9.2.7 The final EIA report of the WCTR**

While the discussion in this section will make reference to the final EIA report of the WCTR, it is not a detailed, chapter by chapter, analysis of the report itself, but rather a more general critique of the project, as it emerges through the EIA report. Some comments about the effectiveness of environmental impact assessments in general will also be included.

It stands to reason that the main objective of a project, such as the WCTR, would play a critical role in determining its physical realisation. The main objective of the WCTR, being a national road is, as expressed in the final EIA report, “to facilitate the safe and efficient movement of

people, goods and services over *medium to long distances between economic centres*” (CCA, 2009: xiii; [emphasis added]). It follows thus that the WCTR is not aimed, primarily, at meeting the economic needs of the Wild Coast area, but rather those of the more remote conurbations at either end of it. The tolling aspect of the WCTR is a means of recovering the cost of its construction and maintenance, but from the point of view of the poor people in the Pondoland area it is yet another financial burden. Other user-unfriendly aspects of the WCTR, apart from the user-costs, include its limited access to facilities, and that it acts as a barrier to the movement of humans and stock. Nonetheless, the developers of the WCTR make much of the argument that it will unlock development in the Wild Coast region. The final EIA report claims that the proposed toll road

would enhance access to the region and would facilitate development of the ecotourism potential of the area ... It is considered that such a national road or “spine” would provide the necessary linkages and impetus to improve the secondary and local networks while facilitating sustainable economic growth along the entire corridor. (CCA, 2009: xiii, xiv)

It is opined here that as such development is incidental, it is usually unstructured and tends to be ribbon development. This undesirable type of development generally springs up along linear projects, and is not unlike that which is to be found along the South Coast in KwaZulu-Natal. Clearly for development in the Wild Coast region to be of more relevance to the local communities, it has to be more areal. Unstructured development could also be insensitive to the natural environment of the area, the key to its eco-tourism potential.<sup>333</sup> One could argue that development of the kind that is more structured and purposeful, would have to result from deliberate governmental intervention. However the government’s track record with regard to development, infrastructural and otherwise, and its maintenance, in the Pondoland area, is not very good (Dlamini, *et al.*, 2013); indeed it is the lack of development in this area that is used by nearly all parties in the WCTR dispute, as a basic motivation for their point of view. One might be somewhat cynical in assuming that the apparent support of the authorities for the WCTR reflects, at least to some degree, a tacit admission of the governmental failure in driving development in this region. While the final EIA report indicates that a significant macro-economic gain would accrue to the Eastern Cape and KwaZulu-Natal *provinces* as a result of the WCTR (CCA, 2009: xxxiii), it does not necessarily mean that, in practice, the affected local

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<sup>333</sup> No-one on either side of the WCTR debate seems to be gainsaying the value of eco-tourism.

communities would benefit correspondingly.

One of the main draw-backs of the WCTR, in particular with respect to the SANRAL preferred alignment, is the impact on the natural environment in general, and more specifically on the PCE. The following statements taken from the final EIA report underline this concern:

It is clear from published information on the PCE that it has a high conservation/biodiversity value and that it has been identified as having high conservation priority ...

The assessment has shown that the proposed new road would result in residual impacts of **HIGH** significance in terms of loss of habitat, fragmentation of habitat, strip/ribbon/secondary development and increased accessibility of remote habitats ...

An analysis of the impacts ... indicates that the SANRAL preferred alignment potentially reduces the core area of the proposed park to 88% of its planned area ...

The potential threat of the proposed new road to *protected, important, unique, sensitive, irreplaceable areas* is therefore potentially significant in the absence of effective conservation management of the area. ...

The proposed road would lead to the direct loss of areas of grassland in greenfields areas as well as some forest, which is considered by definition to be *irreversible loss of natural capital* ...

On the basis of the above criteria, the proposed new road is considered not ecologically sustainable. (CCA, 2009: xxvii, xxix, xxx)

In the face of these serious negative impacts the report does recommend “that a Biodiversity Offset agreement be developed and implemented”, possible in the form of a trust fund. However detail in this regard is scant (CCA, 2009: xxx).

While the final EIA report thus does point out many negative impacts that will result from the WCTR, in overall assessment its general tenor is that these are outweighed by the positive impacts. For example, with respect to the social benefits arising from the WCTR it says that the potential social benefits of the proposed project, as assessed along the entire route, and if enhanced as recommended, would outweigh the potential negative impacts ... (CCA, 2009: xxxi)

And also furthermore (despite the serious drawbacks outlined here above):

The SANRAL preferred and Coastal Mzamba routes would not have a major impact on the potential to undertake biodiversity conservation planning in the PCE area and are thus not considered incompatible with the proposed Wild Coast/Pondoland National Park. (CCA,2009: xxxiv)

Overall these positive assessments might indeed be a reasonable conclusion that one may draw from the written report, but even so some reservations, both in terms of the interpretation of the impacts, and the ambit of the EIA, remain. For example, the limitation of the number of alternatives considered in the EIA, puts some doubt on the top status accorded to the SANRAL preferred route in the EIA. The role that values play in assessing impacts has already been pointed out, and with it instances where the assessments seem to reflect more closely the values of the developers rather than the values of those that oppose the WCTR. Furthermore the report, as a result of the EIA brief, only looks at development potential from the perspective of the WCTR, and thus there is little opportunity for making comparative assessments with other ways (e.g. eco-tourism) of developing the region. Because of this singular perspective on the region's development, it might appear that parties who lodge an appeal against the RoD (which follows on from the EIA report) are thus against, for example, the employment opportunities that the construction and the maintenance of the WCTR will generate. However the appellants against the WCTR would argue that they are not against the employment opportunities that the WCTR could create in the region, but rather that there are better and more efficient ways than the WCTR of doing so. And so, while the terms of reference of an EIA cannot, for practical reasons, be entirely open-ended, it would have been interesting to have had these terms of reference broadened, so that the developmental advantages of the proposed WCTR could be compared to, say, the full-blown development of eco-tourism in the Wild Coast area. It has already been mentioned that an independent comparative assessment between the benefits arising from mining and those arising from nature-based tourism, concluded that "nature-based tourism is a clear winner" (Schutze, 2007: 1). Would this also apply to the WCTR?

While obviously the final EIA report is about the WCTR, and not about development of the Wild Coast region *per se*, the well-being of the inhabitants of the area features prominently in the report, and as such merits further brief comment. The toll road is but one of many factors of impact on the Wild Coast. The well-being of the its peoples is influenced and threatened by an array of conditions:

These include the attention of miners, the proposed N2 Toll Road, increased

population, overgrazing, land use transformation, erosion, rampant alien plants, increased development and over-exploitation of the natural environment. As if this were not enough, the extreme poverty, lack of opportunities, lack of capacity and politics are all having severe additional impacts. (Galliers, 2010: 15)

It is no wonder that many want the WCTR to be the catalyst for development in the Wild Coast area, but the fact of the matter is that the main purpose of the WCTR is to provide a transport thoroughfare, and thus the associated socio-economic development of the Wild Coast area, is more of a byproduct. If the main focus is to be the upliftment of the peoples of the Wild Coast, a different multi-pronged approach would probably be more appropriate. The fact that such a strategy appears not to be in place, or if it is, appears not to be very effective, points to failure in governance. In the words of Galliers, “The lack of cohesive governance along a section of land which is a national and international treasure was very apparent ... ” (2010:15).<sup>334</sup> If thus, in the final instance, it is accepted that the socio-economic development of the Wild Coast area is not the main objective of the WCTR, it still remains critical that the WCTR *should not foreclose or diminish* the potential of other development opportunities (e.g. such as eco-tourism).

The comments in this paragraph are of a general nature. They point to general shortcomings in the EIA process, but with the WCTR EIA, as an example, in the background. If, it is assumed, as one should, that it is the objective of an EIA to pursue sustainable development, then one would hope to see evidence in the EIA report of the extent to which this objective has been met. However it is difficult to define sustainability in terms of concrete parameters. There are, for example, the problems of incompatibility across disparate dimensions and incommensurability within a dimension which have already been mentioned. But there are methodologies available that attempt to address these difficulties. From an environmental perspective there is *ecological footprinting*, from an economic perspective the techniques of *shadow pricing* and *contingent valuation*, and from a social perspective the *human development index*. A more general and overarching methodology is that of *multi-criteria decision analysis*. However, in the WCTR final EIA report, in common with many EIA reports, there is little explicit evidence of the application of these and other methodologies that attempt, inadequate as they may be, to make

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<sup>334</sup> This is not to say that no strategic planning has been undertaken – indeed there have been a number of initiatives in this regard (e.g. *The Wild Coast Conservation and Sustainable Development Project*, ca 2005), but the issue is more a lack of consistent execution.

some assessment of sustainability. Their omission only increases the probability of subjectivity and bias entering into the assessments, while their inclusion would indicate closer adherence to, at least some, of the principles of sustainable development (as outlined in Appendix C16). The ecological footprinting methodology focuses mainly on the carrying capacity principle, the shadow pricing and contingent valuation techniques on the economic efficiency principle, the human development index on the human dignity principle, and multi-criteria decision analysis approach on the holistic and sustainable development principles.

A last comment on the final EIA report of the WCTR concerns the use of the expression “SANRAL preferred route” in the report. It is not only the use of this expression that is concerning, but also the idea that SANRAL seems to exhibit a pre-EIA bias. While some might argue that SANRAL is simply being honest and playing open cards, others might feel that there is some cynicism in going through actions of an EIA, if out of the options available one has already been preferred; is it not precisely the function of the EIA to identify (from a sustainability perspective) the option that *should* be preferred? Does the fact that the developer has a preference, not put some pressure on the EAP, who is being paid by the developer, to interpret the assessment of the developer’s preferred option just a little more favourably? (He who pays the piper calls the tune.) Is it coincidental that the SANRAL preferred route in most depictions of the route alternatives appears as the most clearly marked? These remarks might not ordinarily have been of much consequence, but it seems that SANRAL has at times, defended and championed the WCTR with extraordinary vigour.

### **9.2.8 The role of engineers in the WCTR project**

It would not be inappropriate to categorise SANRAL, the technical agency in charge of national roads in South Africa, as an engineering organisation. It is also evident that the WCC (the consortium that initiated the WCTR project in the first place) was made up of mainly engineering companies. The views of SANRAL and the WCC on the WCTR project may thus be considered as being fairly representative of a so-called engineering perspective. In fairness, the likelihood that the SANRAL/WCC position might have been coloured by an element of self interest, should perhaps make it just a little less representative of a general engineering view. Be that as it may, it is not improbable that most observers would see the strong

SANRAL/WCC advocacy of the project as a typical engineering perspective. It is thus clear that the role played by the engineers in the WCTR project, in contrast to their role in the Garden Route golfing estate developments, is significantly more visible and controversial. As primary players in the EIA process, they were in many instances directly and adversarially pitted against the opposers of the WCTR.

Certain actions of some supporters of the WCTR have been identified as being ethically suspect, and while these supporters may not have been engineers, their questionable actions do, due to the fact that these supporters have the advocacy of the WCTR in common with engineers, expose engineers to the problem of guilt by association. Consider, for example the many “illegal and ‘legal’ roads ... [that] are being bulldozed through sensitive areas of the Pondoland Wild Coast” (Galliers, 2010: 16). While these roads are not directly related to the WCTR project, and may not even have been constructed by engineers, the fact that roads are an engineering activity, and that here they are being built with little consideration for the environment, may inevitably reinforce a perception that the environment is not of great concern to the engineering profession. So whether it be directly through the stances adopted by SANRAL and the WCC, or more tenuously through real or imagined associations with dubious activities, engineers as a group find themselves under scrutiny – a scrutiny that will here be carried through to various aspects of the role they played in the WCTR project, in order to shed light on their commitment, or lack of it, to the ideal of sustainable development.

The support for, or opposition to the WCTR project, can be generalised into three main groupings. For the engineers and other proponents of the WCTR the focus is on the cost and the technicalities around the route alignment, for environmentalists it is to minimise the damage to the natural wealth of Pondoland, and for yet other role players, members of the local communities and their representatives, it is to maximise the benefits that accrue to the community from the project. This is not to say that the engineers are (in general) indifferent to the environmental issues and the needs of the local community, but rather that, for them, the environmental and community concerns do not weigh as heavily as the issues of cost and technical performance. Engineers have, on occasion, ascribed a leadership role to their profession in the matter of promoting sustainable development (see the next chapter), but given the aforementioned generalisations, it could be argued that in order to justify such a leadership

position for engineers, there would need to be some shift in their focus away from mere cost and technical efficiency considerations, to a more holistic perspective.

It can be seen that the three groupings of protagonists in the WCTR saga, as they have been identified here above, roughly correspond to the three main dimensions of sustainable development, namely the economic, the environmental and the social dimensions. It is a principle of sustainable development, as has been outlined in Chapter 7, to marry the objectives of these dimensions, or to put it differently, development that maximises the objectives in only one or two dimensions at the expense of the objectives of the remaining dimensions, cannot truly be classified as sustainable. Engineering practice, as portrayed in this case study, finds itself mostly rooted in the economic dimension, where the traditional paradigm is one of growth and efficiency. The way in which engineering practice, in particular civil engineering practice, is structured in society, predicates that it flourishes under conditions of growth and expansion (particularly where these imply more physical infrastructure). And so now the question arises: to what extent can engineers, operating in the growth paradigm as they do, still claim that they are leading promoters of sustainable development?

The design, construction and operation of a project like the WCTR, is exactly what engineers do, and this fits nicely into the growth paradigm, both in terms of the project itself and the economic activity that the WCTR is envisaged to facilitate. So if engineers are to align their practice closer to sustainability, does this mean that they have to, in general, renounce growth, and in particular, withdraw from projects such as the WCTR? Most engineers would view this expectation as totally unrealistic. Not only do they earn their living this way, they tend to identify with the dictum, 'bigger is better'.<sup>335</sup> Indeed many prized achievements in the field of civil engineering involve what could be called mega-projects. On the other hand it could be said environmentalists in general have a rather jaundiced view of mega-projects; many would say that these projects are the antithesis of sustainable development. Engineers might of course argue that they are simply meeting the 'needs' of society. And so if a paradigm shift towards sustainability is required, it applies as much to society as to engineers. But if engineers want to be leaders in sustainable development, it means that they will have to guide society, instead of taking their cue from society. In more practical terms it means that they will have to point

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<sup>335</sup> Mostly the return of engineering contracts is in proportion to the size (cost) of the project.

their clients to project options that are maybe less cost-effective (in a financial sense) and technically optimal, but on the other hand more holistically beneficial. In the case of the WCTR, it does appear that some of the alternative routes, even if more costly, could largely avoid the PCE, and also meet the needs of the community better.<sup>336</sup> From the point of view of the development needs of the Wild Coast region, a highway, particularly if tolled, does not seem a very appropriate solution. If the WCTR was persisted with in any case, it would need at least, it seems, to be accompanied by an upgrading of the secondary road infrastructure in the area, to have more access points to the toll road itself, and to incorporate a user-friendly toll policy for the local inhabitants. Even if the development of the region was not directly from the WCTR itself, but from other developmental activities that are attracted to the region by virtue of the presence of the WCTR, it could still be argued that these other activities would also benefit from the aforesaid concessions. But it does not seem as if the WCTR developers and engineers were open to these alternative approaches. The WCTR, as approved in the latest RoD, seems to represent a win for the developers and the engineers, and a loss for the local inhabitants and the environmentalists. Sustainable development would be better served by a more balanced win-win solution. It is suggested here that if engineers operate with sustainability (as represented by the PSDF, or similar conceptualisation of sustainable development) as their point of departure, this win-win solution would be more readily achieved.

### 9.3 CONCLUSION

Reviewing the conflicting positions that emerged in the preceding case studies, some of them can, in a general sense, be interpreted as North/South conflicts. The pro-development protagonists, whether they are promoting golfing estates or toll roads, are generally motivated by economic objectives, even if the developments are sweetened by social and environmental intentions. On the other hand the perspective adopted generally by local communities is one which favours the social benefits of projects, whether these be in the form of increased employment opportunities, or more accessible communal benefits such as schooling and health services. While the developer/local community contestation may thus be interpreted as a North/South conflict, there is, in addition, a third grouping of protagonists

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<sup>336</sup> One could in any case ask if the damages imposed on the environment by the SANRAL preferred route have been monetised (contingent valuation) and incorporated into the cost-benefit analyses.

identified in the preceding case studies; it is one which can be described as the conservationist lobby. To them the main issues of concern revolve around the perceived impacts that the projects, be they golfing estates or national roads, inflict on the natural environment, either through excessive resource use or direct damage to the environment. With some generalisation, one can then collectively characterise the three opposing stances that have been identified in these projects, as being a North/South/Conservationist triad. It is furthermore possible to consider this triad as being representative of the three main dimensions of sustainable development, these being the economic, the social and the environmental dimensions.<sup>337</sup> Practice that advances sustainable development not only recognises these three dimensions, but importantly, also strives at balance in meeting the objectives of all the dimensions. It seems thus that many of the problems and conflicts that were highlighted in the discussion of the preceding case studies, can be ascribed to an *unbalanced* consideration of the objectives of the respective dimensions. This could be as a result of the narrow pursuit of self-interest, or ignorance of (or unwillingness to recognise) the full scope of sustainable development. It is this deficient understanding of the concept of sustainable development, as it emerges from the case studies discussed, that suggests that this chapter might be fruitfully concluded, by reflecting again on the dimensional conceptualisation of sustainable development, and particularly the potential for contention between these dimensions. The views of Sachs (1999) in this regard may be found useful.

Sachs identified three separate perspectives that may be applied to sustainable development, and he labelled them respectively as the *contest perspective*, the *astronaut's perspective* and the *home perspective* (1999: 30). Sachs' contest perspective is essentially a Northern perspective that prevails in the face of perceived threats from the South, these being issues like instability, poverty, population growth and increasing market strength.

Having been for a long time the economic masters of the world, the northern elites feel the pressure rising, as the newly industrialized countries become players on the world market. For these reasons, the attention of economic actors is firmly focused on international competitiveness; to counter globalized threats by the particular weapon of 'competitive strength' is their primary concern. (Sachs, 1999: 31)

It is thus evident that this contest perspective is homed within the Western capitalist paradigm, and here, when problems of environmental degradation are raised, they are claimed to be accommodated by converting them into economic opportunities. The belief in, and need for economic growth is not

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<sup>337</sup> In this discussion the fourth dimension used in the PSDF, the institutional dimension, is left in abeyance. It is in any case not as fundamental a dimension as the other three, being more of a facilitative nature.

questioned; it is seen as providing solutions to social and environmental problems rather than being a problem itself. Economic growth, it is argued, creates jobs and pays for environmental protection. It is not so much the use of natural resources that matters but their efficient use. 'Eco-efficiency' is the new mantra.

Shifting consumer demand spurs innovation, trimming down resource use lowers production costs, and environmental technology opens up new markets. Ecology and economics appear to be compatible; and the pursuit of both promises to be, as the magic formula goes, a positive-sum game. (Sachs, 1999: 31)

In this study, the contest perspective is assessed as arising essentially within the economic dimension of sustainable development.

The second perspective, identified by Sachs as the astronaut's perspective, builds on the image that astronauts have of the earth when they look back at it from outer space. It is an image that suggests that the earth is a vital, self-contained body, within an immense, dark inhospitable space. It is an image that should compel all who live on it, human beings in particular, to appreciate and respect the vulnerability and finiteness imposed on it by its cosmic isolation. This astronaut's perspective of the vulnerability of the earth is reinforced by the way in which problems such as acid rain and global warming ignore national boundaries. These, and other far-reaching inter-linkages are being uncovered through earth systems research, powerfully served by the technologies of satellite imagery and advanced computer modelling. In Sachs' assessment this perspective demands a new approach.

The image of the circular earth underscores the assumption, fundamental to this perspective, that ... the entire globe is considered the proper arena for environmental adjustment ... Security against global threats is sought primarily in the rational planning of planetary conditions, not in the defence of the empires of wealth. The fragility of the biosphere under stress by human action, is the storyline of this approach. ... Since, however, the rational design of global conditions can never be achieved without the co-operation of many political actors, some new balance between North and South has to be found. (1999: 36-37)

Environmental assessments and international environmental agreements are the products of this approach, and these are underpinned by the knowledge gained through ecological studies in natural science. Clearly this perspective meshes in with the environmental dimension of sustainable development.

Sachs' third perspective, the home perspective, "is neither about economic excellence, nor about biospherical stability but about local livelihoods" (1999: 38). It could also be characterised as the

perspective of the South, and its primary objective is equity, which can also be styled as environmental justice. The concern here is not about developing the South to be a clone of the North, but rather about limiting consumption levels of the North. According to Sachs

NGOs, social movements, and dissident intellectuals comprise most of the social base of the home perspective. What links the efforts of southern groups with dissidents in rich countries is that both expect the North to retreat from utilizing other people's nature and to reduce the amount of global environmental space it occupies ... From the home perspective, the North is called upon to reduce the environmental burden it places on other countries and to repay the ecological debt accumulated from the excessive use of the biosphere over decades and centuries. The principal arena for ecological adjustment is thus neither the southern hemisphere nor the entire globe, but the North itself. (1999: 39)

This so-called home perspective, with its focus on the curtailment of excessive consumerism and empowerment of the disadvantaged, is essentially a social orientation, and therefore will comfortably fit into the social dimension of sustainable development.

It is not difficult now to effect a tabular correlation between the three articulations of the three dimensional approaches to development; these are the traditional dimensions of sustainable development, the perspectives of Sachs, and the opposing positions that came to the fore in the preceding case studies. A fourth version may be added which is here referred to as that of the *political* positions, and which will be explained in more detail later. This four-version correlation is shown in Table 9.2.

TABLE 9.2: PERSPECTIVES AROUND DEVELOPMENT

<b>Traditional dimensions of sustainable development</b>	<b>Sachs' perspectives</b>	<b>Opposing positions in development projects</b>	<b>Political positions</b>
Economic	Contest	North	Capitalism
Social	Home	South	Socialism
Environmental	Astronaut's	Conservationist	Green

The above table, on the one hand, confirms a broad agreement on the idea of the three-fold dimensionalisation of sustainable development, and on the orientation of these dimensions. On the other hand, it also, more subtly perhaps, hints at the internal tension between these dimensions, which manifests itself in many development projects, such as those discussed in the case studies. This tension,

as has been mentioned, is invariably due to an over-emphasis of the objectives of one of the dimensions. It has been suggested here that examples of this imbalance could be the developers' and engineers' ready acceptance of the techno-economic perspective in both the Southern Cape golfing estates controversy and the WCTR saga. Cock lambasts this bias towards an economic perspective, but then goes further by launching a broadside attack on the capitalist system as a whole. She asserts:

Capitalism is not ecologically sustainable. As Venezuelan President Hugo Chavez proclaimed ... it is a case of “[s]ocialism or death ... capitalism has destroyed the ecological equilibrium of the earth ... [and] we do not have much time left” ... Capitalism ... the force driving this global ecological crisis through its pressure to expand and compete, [is] described by Kovel as a ‘suicidal regime’ ... The pressure is to expand and compete in the drive for profit. The corporate neglect of human needs in the drive for profit ... has had devastating impacts on the poor and the powerless. (2007: 50)<sup>338</sup>

Environmental activists do not escape the ire of Cock either. Environmental NGOs (at least some of them), she argues, have been “socially shallow ... [and] predominantly concerned with preserving biodiversity” (Cock, 2004: 4).

Having denounced capitalist bias in the economic dimension, and socially inept approaches in the environmental dimension, Cock (2004) goes further to argue that it is the concept of sustainable development itself that is at fault. Because it is such a vague concept it has been appropriated by those with political and economic power to the exclusion of the poor and powerless. She claims that while

sustainable development is an advance on earlier protectionist models of environmentalism in that it is concerned with human needs, ... it is generally marked by technicist, pragmatic and reformist attempts to bring environmental externalities into the marketplace through ecological modernization. The concept ... [is] criticized for the vagueness which has enabled it to be incorporated into neo-liberal approaches. (2004: 4)

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<sup>338</sup> While it is not within the scope of this study to enter into a discourse around the perceived capabilities or shortcomings of the various political systems, it may be mentioned that Cock appears to favour a system of *ecosocialism*. Based on the work of Kovel, Cock introduces this system as follows:

If we value a future, “capitalism must be brought down and replaced with an ecologically worthy society” (Kovel, 2002: 149). To overcome capital “there must be basic changes in ownership of productive resources so that, ultimately, the earth is no longer privately owned, and second, our productive powers, the core of human nature, have to be liberated, so that people self-determine their productive power” (Kovel, 2002: 150). Ecosocialism is ‘more than socialism’ with “its association of economic failure, political repression and environmental blight” (Kovel, 2002: 199). Nature will cease to be simply a source (a store of resources) or a sink (a repository of waste). It will “restore the intrinsic value of nature” to a free association of producers (Kovel, 2002: 199). (Cock, 2007: 51)

Because of this perceived deficiency in sustainable development, Cock advocates that it rather be replaced by the concept of *environmental justice*.

The discourse of environmental justice provides a radical alternative, questioning the market's ability to bring about social or environmental sustainability. ... [The] environmental justice movement asks the question 'What is morally correct?' instead of 'What is legally, scientifically, and pragmatically possible?' The difference between the two approaches can be illustrated by the different responses to corporate power ... [One] relies on corporate sponsorship ... [the other] has developed a critical approach demanding corporate accountability. (2004; 5)

It could be argued that Cock's approach, with its socialist flavour, is in itself biased towards the social dimension, and that it represents an opposing pole to capitalism.<sup>339</sup> This contestation between 'capitalism' and 'socialism' (the terms being used loosely here) is evident too in the case studies discussed in this chapter. As both of these approaches, capitalism and socialism, are usually representative of political power, they generally have a stronger power base than approaches which reside in the environmental dimension. This is clearly evident in South Africa where the capitalist and socialist factions are represented in parliament, but the environmental movement has virtually no political face. In some other countries however, 'green' politics have, in recent years, become much more prominent. This leads to the capitalist/socialist/green grouping of the developmental approaches, which is the fourth of such groupings shown in Table 9.2.

It has been demonstrated that competition exists between the three dimensions that characterise each of the four versions of approaches to development, represented in Table 9.2. Thus a need for resolution is manifest. It is here contended that only sustainable development, despite Cock's objections to it, has a chance of equitably bridging this competition. This is because sustainable development, as portrayed in this study (see Appendix F), not only recognises the legitimacy of all the dimensions, but also understands their inherent hierarchy (see Figures 7.1 and 8.1). While many of Cock's accusations against sustainable development have validity, her solution, environmental justice, notwithstanding her theoretical justification thereof, does not enjoy anything near the broad acceptance that is accorded to sustainable development, and it is thus ruled out (at least in the short term). If then interpretations have been placed upon sustainable development that have, as Cock contends, allowed it to be hijacked for

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<sup>339</sup> Cock might instead argue that her position is more than simply socialist, given the favour it bestows on environmental justice.

mercenary purposes, it is these inappropriate interpretations that should be challenged, rather than the concept itself. In this study the challenge, with respect to the interpretation of sustainable development, has been answered by formulating the concept in the format of a framework; a framework of sustainable development, that contains, *inter alia*, its vision, values and principles.

In promoting environmental justice Cock argues that it provides answers to the question, “What is morally correct?” instead of only, “What is legally, scientifically, and pragmatically possible?” However sustainable development, given the moral foundation ascribed to it in this study, and its broad range of descriptors, answers *both* of the above questions. All the strengths that Cock attributes to environmental justice, anti-consumerism, the empowerment of the poor and the political thrust against class prejudice, can be dealt with adequately by the expanded form of sustainable development as presented in the PSDF (see Appendix F). Besides, there is no guarantee that the application of environmental justice will not itself be prejudiced by, for example, its undervaluing of the efficiency principle of the economic dimension, or by its failing to perceive the hierarchical position of the environmental dimension. Moreover, as environmental justice has been included as a principle in the PSDF, none of its advantages are omitted in the application of the PSDF, and by virtue of the wider scope of the PSDF, much more is gained.

This chapter may now be concluded with a brief summary. The two case studies critiqued here, showed that many of the problems and controversies that occur in development activities, can be framed as contestations that occur between the economic, the social and the environmental fields of interest. These contestations can be addressed through the notion of sustainable development. This concept, while it has its detractors, still remains, given the scope and depth accorded to it in the PSDF, the best available vehicle to guide development, so that it is economically feasible, socially acceptable and environmentally sustainable. Finally, the case studies also suggested that engineering practice generally reflects a techno-economic perspective, which is short of the broad approach ascribed to sustainable development in the PSDF. Thus the next chapter will attempt to address this shortcoming, in the South African context.

## SECTION D

### SUSTAINABLE DEVELOPMENT AND ENGINEERING IN SOUTH AFRICA

The practice of engineering has arrived at a fork in the road. The signpost to one direction says “sustainable development”, a broad concept that encompasses economic and social wellbeing, as well as sustainable management of resources. The other points to an increasing isolation of technology from reality. Historically, engineering has been a principal agent of development. It must now become a principal agent of sustainable development. (Thom, 1995: 25)

This dissertation commenced with a narrative named *The Parkway that never was*, which described a practical instance of the so-called environmental dilemma, i.e. the perceived clash between development initiatives and environmental concerns. This was thought to be an appropriate introduction to the problematic topic of the relationship between civil engineering and sustainable development. The study then continued with in-depth discussions around firstly, philosophical ethics and environmental ethics, and then secondly, the concept of sustainable development, all of which culminated in a proposed framework for sustainable development. This framework is succinctly summarised in Appendix F. Discussion continued with an overview of South African environmental law and policy, with particular reference to sustainable development. Against the background of the work done up to this point, two case studies were then considered. In the first, which dealt with the proliferation of golfing estates in the Garden Route area, the focus fell, in the main, on societal choices around sustainability. The role of engineers in sustainability questions became more pertinent in the second case study, which covered the saga of the N2 toll road through the Wild Coast area of the Transkei region. The general conclusion at this point was that engineering practice faced some significant challenges in dealing with the values and principles of sustainable development. So it now becomes appropriate to ask *how the civil engineering profession should respond to the challenges presented by sustainable development?* According to Cruickshank and Fenner:

Engineers need to re-evaluate their role and responsibilities in the development process and re-address what it is ... [they] are trying to do, [and] to demonstrate that ... [they] have an understanding of the broader issues and ... are able to construct appropriate solutions. ... To achieve this, two areas must be addressed. First, clear guidelines need to be articulated that help engineers both develop and assess the sustainable development implications of their work. Secondly, achieving the necessary skills to implement sustainable development requires modifications to the way engineers are educated. (2007: 114)

The question of how civil engineers should respond to the challenges of sustainable development will thus be addressed on two fronts; firstly attention will be focussed on sustainability guidelines for civil engineering practice, and then secondly, the focus will move to the sustainability education of civil engineers.

Chapter 10 then will address the first of the two areas mentioned, namely that of the proper relationship between civil engineering and sustainable development. An overview of a number of codes of conduct, from across the world, that deal with the civil engineering/environment/sustainability relationship, will be followed by some suggestions for such a code of conduct for civil engineers in South Africa.

If engineers are expected to measure up to the demands of sustainable development, as it may be outlined in a code of conduct, one may rightly ask to what extent their education prepares and equips them for this task. It is possible that South African engineering educational programmes may need to be adapted in an effort to ensure that the ideals of sustainable development are inculcated in the graduates of these programmes. These questions around the sustainability education of civil engineers in South Africa will form the basis of the discussions in Chapter 11.

## CHAPTER 10

# HOW CAN THE CIVIL ENGINEERING PROFESSION IN SOUTH AFRICA RESPOND TO THE CHALLENGES OF SUSTAINABLE DEVELOPMENT? – PART 1

Many professional bodies and institutions have at their core a Code of Ethics which represents the bond between society and the profession. Codes of Ethics represent the espoused theory of professional science and engineering institutions, and tend towards a social contract model of practice. ... So, from this angle, the new model of expertise raises two challenges: first, we need to develop an espoused theory of professional practice that fully reflects sustainability and, secondly, we need to align our espoused theory and the theory we use in practice. (Mitchell, Carew & Clift, 2004: 43)

This chapter will look at how codes of conduct, or ethics, can enable civil engineering practice to be synchronised with the demands of sustainable development. But first, it may be useful to consider, in a more general sense, the relationship between engineering and sustainable development.

### 10.1 ENGINEERING AND SUSTAINABLE DEVELOPMENT

Although a four-dimensional model of sustainable development, depicted by four *intersecting* circles, one of which represented engineering objectives, was briefly considered in Chapter 6 (Figure 6.6), it was a three-dimensional, *nested* circles model (Figure 7.1),<sup>340</sup> which excluded explicit reference to engineering, that was subsequently considered to be more appropriate. Now, however, in order to better understand the relationship between engineering and sustainable development, the idea of a fourth dimension of engineering will be revived here, but this time using the format of nested circles. It is believed that by depicting engineering as being nested within the other spheres of influence, its hierarchical dependency on them is more realistically portrayed, and that such a portrayal can help engineers to find a proper sense of integration for their activities in the general paradigm of sustainable development. This nested four-dimensional model of sustainable development, with engineering included as the fourth dimension, is shown in Figure 10.1.

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<sup>340</sup> Again, for the purpose of the present discussion, it is not deemed necessary to include the fourth dimension of sustainable development (the institutional dimension) as it is represented in the PSDF.

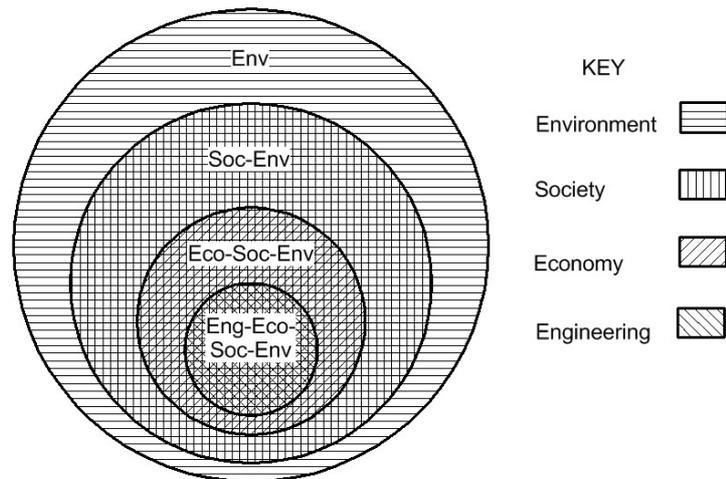


FIGURE 10.1: INTEGRATED DIMENSIONS OF SUSTAINABLE DEVELOPMENT

Apart from the inclusion of an engineering dimension into this model of sustainable development, it also reveals, in a more subtle way, the significant *hierarchical integration* of the dimensions. This is achieved through the superposition of the respective hatching patterns. It thus emerges that of all the dimensions it is only in the environmental dimension where some activities can take place that are independent of the other dimensions.<sup>341</sup> In the other dimensions activities are, explicitly or implicitly, integrative of aspects from more than one dimension. For example, in the social dimension activities may be seen, if their implications are to be fully understood, as interconnections between *at least* the social *and* environmental modalities. In similar fashion the economic dimension is an infusion of at least the economic, social and environmental modalities, and in the final instance, the engineering activities need to be an integration of environmental, social, economic and engineering considerations. That is not to say that in practice engineering activities are not infrequently seen and judged solely from an engineering perspective, but the argument here is that such a limited perspective is, in the context of sustainability, incomplete and, in the broader scheme of things, defective.

This model of sustainable development thus implies that a view that sees sustainability simply as an add-on to the usual elements of engineering practice, or that it can simply be an additional subject to be included in the engineering curriculum, is in a fundamental sense, flawed. Sustainability should in fact, rather than being an adjunct to engineering, be the context in which engineering endeavours should take place. In other words, sustainability cannot simply be an add-on to engineering, but instead

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<sup>341</sup> An example might be animals breeding in the wild.

it should be a main canon of the engineering discipline.

While this argument for a fundamental link between sustainability and engineering has so far been based on theoretical considerations, it also needs to be confirmed in practical situations such as those discussed in the case studies covered in the previous chapter. In development activities, be these golfing estates, highways, or any other, sustainability or the lack of it, appears to be irrevocably coupled to the way in which engineering in these developments is practised. Engineers, or at least the leading organisational structures within the engineering profession, have become increasingly aware of this link. The World Federation of Engineering Organisations (WFEO), for example, perceives this linkage as follows:

This concept of sustainability is best illustrated by natural ecosystems, which consist of nearly closed loops that change slowly. For example, in the food cycle of plants and animals, plants grow in the presence of sunlight, moisture and nutrients and are then consumed by insects and herbivores which, in turn, are eaten by successively larger animals. The resulting natural waste products replenish the nutrients, which allows plants to grow and the cycle to begin again. ... The roles of engineers in sustainable development can be illustrated by a closed-loop human ecosystem that mimics natural systems. (WFEO, 2002: 1)

The closed-loop human eco-system, as envisaged by the WFEO, is depicted in Figure 10.2.

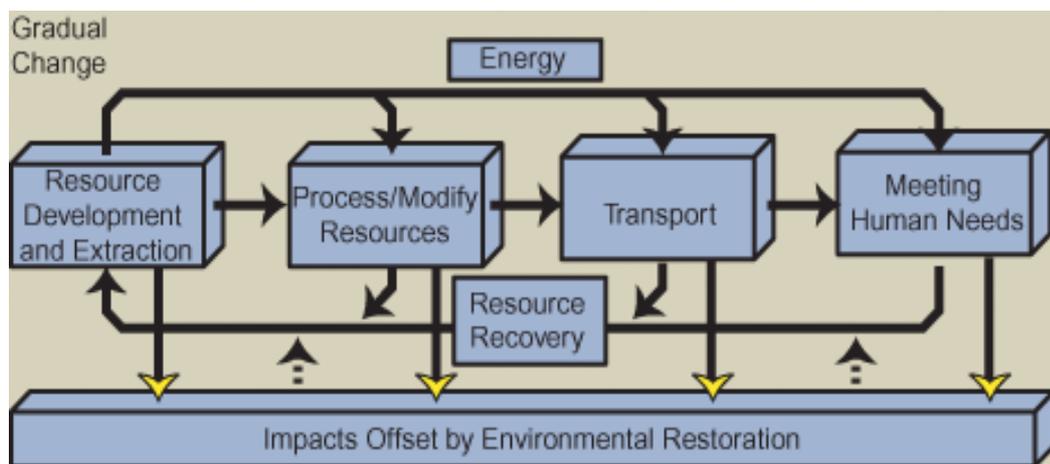


FIGURE 10.2: MODEL OF CLOSED-LOOP HUMAN ECO-SYSTEM  
(WFEO, 2002: 1)

According to the WFEO model, engineers are involved in this entire chain of production and consumption:

- They should develop, process and transport natural resources in closed-loop systems, and through re-use and recycling reduce waste and increase efficient resource use.
- They should harvest renewable resources within the natural limits, and minimise the use of non-renewable resources
- They should improve living standards in many ways, *inter alia*
  - by providing clean water, energy, housing, commercial buildings, streets and other forms of infrastructure,
  - by efficiently storing and distributing food, and
  - by meeting acceptable health standards. (WFEO, 2002: 2)

WFEO have also produced a detailed breakdown of the above engineering objectives into lower level tasks, and this breakdown has been reproduced in Appendix K. However, for the present purposes, it is not deemed necessary to go into a detailed discussion of these tasks, except to say that a perusal of them can only but reinforce the conclusion that engineering is an integral cog in the sustainable development machine. This last metaphor and the list of engineering tasks in Appendix K might attract the criticism of representing a technicist bias in the understanding of sustainable development, and that its social and economic dimensions are being underplayed. This perception may be further strengthened when leading engineering organisations appropriate a leadership role for engineers in sustainable development. For example, the American Society of Civil Engineers (ASCE) says of engineers that it is

their responsibility to provide effective and innovative solutions in addressing the challenges of sustainability. ...

Engineers have a leading role in planning, designing, building and ensuring a sustainable future. Engineers provide the bridge between science and society. (ASCE, 2010b: 1)

Also, the International Federation of Consulting Engineers (FIDIC) asserts that the

consulting engineering industry is uniquely positioned to provide leadership in implementing sustainable development because it plays a central role in society throughout the world. (FIDIC, 2002a: 7)

There can be no doubt that engineers do play a significant role in our world, providing as they do,

products and infrastructure that meet society's needs and wants, at respectively the society/economy and the society/environment interfaces (Cruickshank & Fenner, 2007: 112). With engineers being so heavily involved in all developmental activities, the technical bias in their interpretation of sustainable development is understandable and perhaps unavoidable, but it does not mean that organised engineering is blind to the fuller picture of sustainable development. For example, one of the organisations quoted here above, the ASCE, argues that the role of engineers in sustainable development requires that they should:

- Promote a broad understanding of economic, environmental, political, social, and technical issues and processes as related to sustainable development;
- Advance the skills, knowledge and information necessary for a sustainable future; including habitats, natural systems, system flows, and the effects of all phases of the life cycle of projects on the ecosystem;
- Advocate economic approaches that recognize natural resources and our environment as capital assets;
- Promote multidisciplinary, whole system, integrated and multi-objective goals in all phases of project planning, design, construction, operations, and decommissioning;
- Promote reduction of vulnerability to natural, accidental, and willful hazards to be part of sustainable development; and
- Promote performance based standards and guidelines as bases for voluntary actions and for regulations in sustainable development for new and existing infrastructure. (2010b: 1)

Engineering, as it is often practised on the ground, and as it is evidenced in the case studies of the preceding chapter, does not as a rule meet these lofty ideals. A group of engineering researchers, mostly from the University of Cambridge in the UK, recognised the need for engineers to widen their horizons. Expanding on the work of others they devised a “sustainable framework for civil engineers” which widens the scope of civil engineering from the traditional three objectives of civil engineering, namely quality, cost and time, into eight new domains which they named:

- ethical foundation,
- justice through participation,
- efficient provision and co-ordination of infrastructure,
- maintenance of natural capital,
- holistic financial accountability,

- systems context,
- interlinking scales, and
- future vision. (Fenner, *et al.*, 2006: 147-148)

In each of these domains the researchers framed a number of questions which “allow an engineer to test ‘how sustainable am I being?’ in terms of engineering decision-making on a real project” (Fenner, *et al.*, 2006: 146). They have also presented a graphical depiction of their model, here called the Cambridge model. This depiction and a summary of the main elements of the model are reproduced in Appendix L. The reasons for reporting and commenting here on the Cambridge model of a “sustainable framework for civil engineers”, are the following:

- This model offers, together with other examples, such as the Sherbrooke model (see §7.1.6 and Gagnon, *et al.*, 2009) credible proof that within the engineering fraternity there are significant efforts to articulate the link between engineering and sustainable development.
- By comparing the Cambridge model to the sustainable development framework (PSDF) being proposed in this study (See Appendix F), it offers further validation of the PSDF.

The second point made here above, is further motivated in tabular form in Appendix L, where it is shown that all aspects of the Cambridge model, as communicated via the questions that the researchers proposed for each of the eight domains of the model, are covered by the sustainable development principles included in the PSDF. Cruickshank & Fenner (2007: 117) have suggested key criteria and summary questions which can “help to structure consideration about the contribution of a project towards sustainable development”, and these too can be correlated with principles from the PSDF, as shown in Table 10.1 here below.

TABLE 10.1: SUSTAINABLE DEVELOPMENT – CORRELATION OF KEY CRITERIA, QUESTIONS AND PRINCIPLES

<b>Key criteria*</b>	<b>Question*</b>	<b>Corresponding PSDF principles**</b>
Is maintainable	To what extent can the development be operated, maintained and renewed without external intervention?	Practicality Corporate responsibility
Meets a need	How does the development contribute to addressing a need and in what ways does the development contribute positive benefits to the recipient and wider community?	Fairness Dignity
Is culturally appropriate	How culturally appropriate is the development considering who was responsible for its assessment?	Fairness Participation
Is appropriately affordable	Are those responsible for the initiation, operation and maintenance of the development willing and able to pay the costs required?	User pays
Does not unreasonably consume resources	What level of consumption of renewable and non-renewable resources is caused by the development and how appropriate is this consumption?	Carrying capacity Conservation
Is not excessively damaging	What effect does the development have on the condition of the global commons and on local resources including human and social capital?	Minimum impact Dignity
Promotes equity	In what ways does the development increase intra-generational equity addressing issues of gender equality, reduction of poverty and improving rights for children?	Holism Dignity Empowerment
Allows future development	Does the development allow for future development possibilities and in what ways are future developments constrained?	Carrying capacity Holism

\*Cruickshank & Fenner, 2007: 117

\*\* See Appendix C16

While it must be admitted that the correlations between the principles of the PSDF and other models of sustainable development are applied somewhat flexibly, as the direct correspondences between verbal formulations can only be assessed subjectively, the level of correlation, such as it is, still confirms general commonality between the various models of sustainable development in terms of their objectives and scope. Having said that, it is further argued here that the twenty-one principles built into the PSDF in support of its vision and values, and its hierarchical, four-dimensional structure renders it more comprehensive than the uni-level, eight-domain Cambridge model.<sup>342</sup> In addition it is suggested here that the PSDF may have several other advantages over the framework proposed by Fenner, *et al.*

<sup>342</sup> The graphical depiction of the Cambridge model reproduced in Appendix L may suggest that the eight domains are more peripheral than the three core engineering objectives, but it is doubted if that was the intention of the developers.

(2006). Firstly, there is the integrative perspective of the PSDF, graphically depicted in Figure 10.1, which the Cambridge model underplays, or at least so it seems at first appearance. The eight domains of the Cambridge model appear too much like add-ons. Furthermore, the questions included in the Cambridge model are useful, but it remains uncertain as to how many positive answers to the listed questions are needed to constitute sustainability. It seems that the consistent application of the rules applicable to a domain is not insisted on. For example, Fenner, *et al.* say of their model,

In this framework, while the widely accepted need to maintain ecosystem function and diversity is important, it is not the sole or overriding driver. (2006: 147)

On the other hand, Figure 10.1 shows that for the PSDF this is not the case, or put differently (referring specifically to the point made by Fenner, *et al.* in the above quote), for sustainability to be achieved the carrying capacity principle of the PSDF is non-negotiable. Speaking more broadly, the PSDF is based on principles which, in theory, all have to be adhered to, if sustainability is to be achieved – the contravention of any principle will constitute a reverse on the path to sustainability. The rigidity implied by this last statement is tempered by the structured hierarchy of the PSDF where the upper levels of the model are foundational and non-negotiable, the lower levels are more flexible. This does not mean that the lower level principles can be ignored willy-nilly; a deviation, if any, can only be contemplated on the basis of a thorough justification. This nuanced interpretation of the PSDF is perceived to be a pragmatic strength, which is not quite as evident in the Cambridge model. In connection with the latter Fenner, *et al.* say that “Sustainable development *could* become a guiding concept for engineers in the 21st century” (2006: 145; [emphasis added]), whereas the position adopted in this study is that it *must*.

It is thus here concluded that the PSDF is, for the moment, an adequate model on which to elaborate the linkage between engineering and sustainable development. Having said that, it will still be, it seems, inordinately difficult for engineers to practice true sustainability, due to certain structural problems that they face in society. Donnelly and Boyle list five such problems:

- (1) the problem of existing paradigms of development;
- (2) the problem of scope;
- (3) the problem of framing versus solving;
- (4) the problem of context; and
- (5) the problem of conventional education. (2006:149)

These problems are not mutually exclusive and they arise in the role that society ascribes to engineers. The first of these problem areas recognises that development projects tend to be viewed in isolation,

and that attempts made to assess their sustainability, are mostly inadequate, *inter alia*, because of their short term focus, their failure to address cumulative effects and because they do not challenge existing paradigms of growth. According to Donnelly and Boyle

current sustainability assessments do not measure sustainability and yet are increasingly favored by regulatory authorities and clients as being able to deliver sustainability. (2006: 150)

The second problem identified by Donnelly and Boyle is related to the first, and is rooted in the fact that engineering work is often project based or confined to a certain site. Adequate sustainability considerations on the other hand require broad-based, regional approaches, that are beyond the briefs normally supplied to the engineers. Tied to this concern, Donnelly and Boyle identify as their third problem area, the fact that engineers are expected to provide solutions to a given problem, but are not much involved in the framing of the problem. For example, in terms of sanitation provision engineers are frequently expected to provide new or extended water-borne sewerage systems, but in a water scarce country like South Africa, the sustainability of these systems is questionable, and yet the option of using alternative systems are mostly not included in the engineering briefs. Engineers are generally very good at solving problems, but in order to deliver sustainability they may “need to look beyond the problem as it is presented to them” (Donnelly & Boyle, 2006: 151).

The fourth problem area underlies those previously mentioned, inasmuch as it deals with the total social milieu in which engineers operate, and in essence it says that society constrains the way in which engineers can operate. To put it differently, the demands of true sustainability run so deep that they, in effect, require fundamental societal changes which, in this sense, are requisite precursors to the implementation of sustainable solutions by engineers.

Within the context of current social, cultural, political, economic, and institutional arrangements, it can be very difficult to generate the incentives for engineers to actually pursue more sustainable ways of doing things. Thus, in the absence of regulations requiring a sustainable outcome, any sustainable solution must compete directly with conventional solutions that favor the status quo. (Donnelly & Boyle, 2006: 152)

While the political steps required to bring about the societal changes needed for sustainable development are considered to be beyond the scope of this study, the above quote does hint at the need for “regulations”, or in the context of engineering, an appropriate code of conduct, and this will indeed be the topic for the next sub-section. The fifth and final problem that, according to Donnelly and Boyle, obstructs the inclusion of sustainability into engineering practice, is that of the conventional education

of engineers, which, it is contended, fails to inculcate a sustainability ethic in graduate engineers. In recognition of the importance of this point, the next chapter will specifically be devoted to a discussion of the implications of sustainability for engineering education.

Before leaving the problem areas listed by Donnelly and Boyle, it might be worthwhile to return to a more specific manifestation of the problem of context, in order to underscore its pervasive restrictiveness, not only generally, but also for engineers. The context in which many engineers operate, is that of a modern industrialised society, and in this context they are inevitably involved with that signature characteristic of such societies, namely that of overconsumption. Individual engineers are, together with all those who pursue Western lifestyles, under societal pressure to overconsume.<sup>343</sup> But perhaps even more pernicious is their contribution, *as a profession*, to the problem of overconsumption. It readily acknowledged that Western orientated consumers use far more than their fair share of the Earth's natural resources. Most of these resources are accessed and converted into commodities for human consumption by technological means. Western type commodity markets operate on the basis of competition which drives producers to produce more advanced products, and then the increased array of products available, together with the relative affluence of consumers, leads to ever increasing levels of consumption. And hence one may legitimately ask whether engineers, being as heavily involved in the production processes as they are, do not carry some ethical culpability in respect of the problem of overconsumption? Do they not, in their attempts to make extraction and production processes more efficient, and infrastructure more amenable, contribute to excessive consumption?

At its heart the problem of overconsumption compromises some of the main pillars of sustainability. Firstly, and obviously, there is its direct confrontation with the principle of carrying capacity, not only in terms of resource consumption but also in terms of waste assimilation. Secondly the uneven patterns of consumption between citizens of the North and those of the South<sup>344</sup> are contrary to the notions of equity and fairness. This is illustrated in Figure 10.3 which conveys a similar message to that of the ecological footprint, as depicted in Figure 7.3. It confirms that Western countries exceed their equitable share of consumption by far.

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<sup>343</sup> A practical example might be that of cell or mobile phones. At the end of a certain period consumers are enticed to have them replaced, not because they are not functional anymore, but rather because they are perceived as old fashioned compared to their technologically more advanced replacements.

<sup>344</sup> Bear in mind that while the North/South dichotomy is mostly applied to nations, it is also applicable to the class groups within national boundaries.

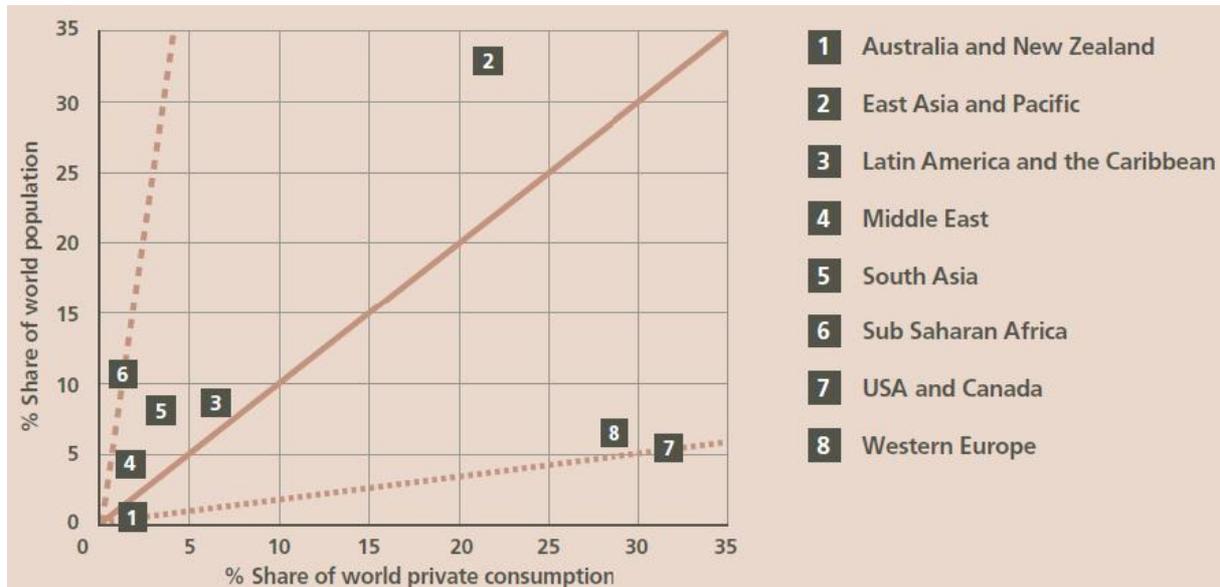


FIGURE 10.3: POPULATION SHARE VS CONSUMPTION SHARE  
(Jowitt, 2006: 17)

More insidious is the contribution of overconsumption to such social ills as stress and debt, which are so very evident in modern consumer societies, and which, as Woodhouse records, have been variously dubbed as “affluenza” or “luxury fever” (2001: 24).

Robert Lane, the world’s foremost authority on psychology and the market system, documents the decline of happiness in market democracies worldwide, and he traces the phenomenon primarily to consumer society. (Woodhouse, 2001: 24-25)

While it is relatively easy to characterise overconsumption as a social ill, it is far more difficult to find a workable remedy. Yes, Western societies need to consume less, but how is this to be effected? While individual engineers may acknowledge the problem of overconsumption, if they were to follow a strict regimen that refuses all commissions which may promote overconsumption directly or indirectly, that would soon see such engineers joining the ranks of the unemployed. According to Woodhouse,

It is not just that many engineers would find it difficult to keep their jobs if they actively opposed present imbalances and excesses, they would even jeopardize their livelihoods if they merely refused to accelerate overconsumption. (2001: 27)

It has been suggested that the ethical responsibility of engineers can be approached at three levels, and Woodhouse (2001: 25-27) evaluated these approaches against the challenges of overconsumption. The first approach, at the lowest level, called the “minimalist view” by Harris, *et al.* (2000: 101-102), simply requires engineers “to conform to the standard operating procedures of their profession”. This

approach is unquestionably inadequate as it is often these “standard operating procedures” themselves that are suspect in terms of promoting overconsumption.

The second, more demanding approach, is that of exercising “reasonable care”, which means that the interests of the public are of prime concern (Harris, *et al.*, 2000: 103-104). Here the focus shifts from what engineers see as appropriate practice to what the public deem as acceptable practice. But this approach also appears to be, in respect of overconsumption, deficient. If the public are exactly those who pursue the fruits of overconsumption, it is certainly not their expectations that will promote an engineering practice geared towards less consumption. One could of course argue that what the public want, and what is in their interest, are two different things. That, however, still does not solve the problem of overconsumption as far as engineers are concerned.

The third approach, even more exacting than the second, the so-called “good works” approach, is characterised through actions “above and beyond the call of duty” (Harris, *et al.*, 2000: 104-107). If the first approach represents adherence to the letter of a code of conduct, and the second adherence to spirit of a code of conduct, then this third approach represents actions which are beyond even that which can optimistically be expected to arise from an engineering code of conduct. While these actions are not expected, when they are performed they will earn general praise as “good works”. Consider for example the case of an engineering company that has been mandated to install an irrigation water supply system for a local community. Having completed the mandate, the installation engineer might, in his or her own time, assist the community in scheduling their irrigation applications so as to maximise the water use efficiency. This engineer has acted beyond the call of duty, and while his or her actions in this regard fall outside of the scope of the job the company was commissioned to do, they will still merit praise for the high level of ethics that they represent. Is this approach adequate to address the problem of overconsumption? Woodhouse thinks not; he argues,

[While] many thoughtful engineers probably find troubling the sheer quantity of items produced, sold, and eventually discarded in consumer societies; yet can we really imagine industrial design engineers arguing with Fisher-Price executives that children already have too many toys? Or aerospace engineers campaigning against additional jet travel to frivolous conventions? Or civil engineers opposing construction of new hotels to host those conventioners? Or biomedical engineers arguing that clean drinking water for poor countries is more important than keeping the affluent alive for a few more years? (2001: 27)

While the actions of the installation engineer, in the irrigation water supply example here above, will

be recognised by society as praiseworthy, the actions against overconsumption, as mooted by Woodhouse here above, will probably be seen as not only illogical but also anti-social. While Woodhouse sees the problem as “dauntingly difficult”, and has no “magic formula” to offer, he does propose the following:

If the traditional approach to engineering ethics will not work against overconsumption, it makes sense to cast about for possible alternatives. I propose that we try reversing all four of the central elements in the traditional approach: Instead of emphasizing 1) good behavior 2) on mandated tasks 3) by individual engineers 4) in the workplace, let us focus on 1a) thoughtful discussion 2a) on optional tasks 3a) as a collective professional responsibility 4a) outside the workplace. (2001: 28)

In essence the Woodhouse message is that the alignment of conventional engineering practice with sustainability will be a very difficult task, and that it might not even be a feasible task for the present coterie of engineers. Without doubt much can be done to make engineering practice more compatible with sustainability – the focus on appropriate codes of conduct in the next sub-section will be evidence of such an approach. One might say that this puts engineering on the road to *weak* sustainability. But what about the requirements for *strong* sustainability? When Woodhouse speaks of a “collective responsibility outside the workplace”, does this not perhaps point to a new kind of engineering practice, inhabited by a *different* type of engineer, rather than an *enhanced* type? In other words the paradigm change to true sustainability might be so fundamental that engineering practice will have to undergo a core change in order to meet this challenge, and that this might require engineers different in a fundamental sense from the engineers being produced today. This notion will be explored further in the next chapter.

## 10.2 ENGINEERING CODES OF CONDUCT AND SUSTAINABLE DEVELOPMENT

While the following discussion on codes of conduct and sustainability will primarily be done with the civil engineering profession in mind, it is surmised that it will be possible to generalise much of the discussion to the engineering profession as a whole. Therefore, in the following overview of relevant codes of practice from around the world, it will be deemed acceptable to draw examples from the whole field of engineering, and not necessarily only from the field of civil engineering. However before proceeding to the overview itself, it seems appropriate to first bring some more clarity to the terms and expressions that will be used in the overview.

### 10.2.1 Clarification of terminology

In a discussion on professional codes, phrases such as, *code of ethics*, *code of conduct* and *code of practice*, may need some further elucidation. But before defining these phrases, it may be noted that they are here being employed in relation to a *profession* (the engineering profession, or to be more particular, the civil engineering profession), and hence it is also the concept of a profession that needs to be clarified. A profession may be defined as a “vocation or calling, esp. one that involves some branch of advanced learning or science”,<sup>345</sup> and then also as the “body of people engaged”<sup>346</sup> therein.<sup>347</sup> While these definitions would apply neatly to the engineering profession as such, it is in addition a further interpretation that is applied to the term *profession*, namely that of “a declaration or avowal”,<sup>348</sup> that is also of particular significance for this study. This is because in many a profession there is an actual declaration that obligates the members of that profession to maintain high standards of vocational proficiency and personal conduct. While in some instances such a declaration may be a stand-alone affirmation (e.g. the Hippocratic Oath as applied the medical profession), in the case of the engineering profession it takes the form of (at least as far as this study is concerned) a *code of ethics*, or a *code of conduct*, or suchlike.

It is also said that professions have certain distinguishing characteristics, which include the following:

- Entrance into a profession typically requires an extensive period of training ... of an intellectual character ...
- Professionals’ knowledge and skills are vital to the well-being of the larger society ...
- Professions usually have a monopoly or near monopoly on the provision of professional services [in their area of expertise]...

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<sup>345</sup> *Reader’s Digest Oxford Complete Wordfinder*, 1993. London: Reader’s Digest Association Limited.

<sup>346</sup> *Ibid.*

<sup>347</sup> Speaking specifically of engineering, Vesilind and Gunn “maintain that engineering *professionalism* is in the public interest”, and they also express the belief “that most engineers are motivated by a genuine and principled concern for the public good” (1998a: 19).

<sup>348</sup> *Ibid.*

- Professionals often have an unusual degree of autonomy in the workplace ...
- Professionals claim to be regulated by ethical standards, usually embodied in a code of ethics. (Harris, et al., 2003: 12-13; [numbering omitted])

According to Martin and Schinzinger, “professions are those forms of work involving *advanced expertise, self-regulation* and concerted service to the *public good*” (2005: 21; [emphases added]). The requirement of “advanced expertise” is covered by setting certain standards of education, by making registration as a professional a prerequisite, and by enacting various codes of practice. Most of these issues are covered in the next chapter, but for the moment, it is the notions of “self-regulation” and “public good” that are of more interest, as they seem to presuppose a code of ethics or conduct. One may argue that it is through a code of ethics or conduct that a profession tries to ensure that its members serve the public good. While it is in the general spirit of professionalism that a profession will itself regulate the conduct of its members, in many countries this has been expanded to include legal prescriptions. The legal circumscription of the engineering profession not only requires engineers to meet certain standards of conduct, but generally also limits the execution of certain types of engineering work to persons who have been legally registered as being competent to do such work. Such engineers are then entitled to exhibit their status as registered engineering professionals by the use of a special appellation, and by letters added to their name. In South Africa, for example, registered engineers are known as “professional engineers”, and they may designate this status by adding the letters “Pr Eng” behind their names.<sup>349</sup> Registration requirements may vary from country to country, but mostly a higher qualification in engineering is required, together with a minimum period of post-qualification work experience in engineering practice, and sometimes also a professional examination. Legal bodies are constituted to manage the registration process, and these usually oversee the whole of the engineering profession in the name of public interest. In addition there might also be learned bodies, with voluntary membership, which aim primarily at promoting the body of knowledge in a certain discipline in the engineering field, and then there may also be voluntary associations that look after the interests of registered professionals. All of these bodies may have their own codes of ethics or codes of conduct.

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<sup>349</sup> There are other grades of engineering registration as well, but these need not be elaborated on here as the codes of ethics or codes of conduct prescribed for registered persons make little, if any, distinction between the various grades of registration.

In South Africa the legal body entrusted with the task of controlling professional engineering registration is the Engineering Council of South Africa (ECSA),<sup>350</sup> and according to ECSA professional engineers should:

- (1) apply their knowledge and skill in the interests of humanity and the environment;
- (2) execute their work with integrity, sincerity and in accordance with generally accepted norms of professional conduct;
- (3) respect the interests of their fellow beings and honour the standing of the profession;
- (4) continuously improve their professional skills and those of their subordinates;
- (5) encourage excellence within the engineering profession. (ECSA, 2006a: 1)<sup>351</sup>

While the above may be considered as the definition of professionalism (applicable to engineers in SA), it may also, with the use of words such as *integrity*, *sincerity* and *honour*, be seen as an ethical prescription. A code of ethics could thus be seen as the moral prescriptions applicable to a profession, or in other contexts, it could also be applicable to a company or to an organisation. The above excerpt is extracted from an ECSA document which is entitled “Rules of Conduct for Registered Persons”,<sup>352</sup> and it thus appears that a code of conduct may be very similar to, if not synonymous with, a code of ethics. A code of ethics may have more of a moral flavour to it such as when the code prescribes that the values of honesty and integrity be upheld in the profession. Many codes of conduct also deal with moral issues, but they may also deal with matters of professional etiquette such as when it is required that members of the profession should not advertise their services in a self-laudatory manner.

In an engineering context a *code of practice* often refers to a technical prescription that pertains to the methodologies that should be applied to specified engineering tasks, and it is by adherence to these methodologies that the objectives of technical proficiency and ultimately concern for the public welfare are addressed. ECSA quotes the Standards Act of 1993 (Act No

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<sup>350</sup> The Engineering Profession Act (No 46 of 2000) governs the establishment and operation of ECSA.

<sup>351</sup> The latest version of these rules adds a prescription not to “prejudice public health and safety”. (ECSA, 2013: 1)

<sup>352</sup> In this context a ‘registered person’ refers to a person who has been registered by ECSA, and these include not only professional engineers, but also technologists and technicians, and it is only when a person is registered in one of these grades, that he or she is permitted to do certain types of engineering work.

29 of 1993) to define a Code of Practice as

a description of:

- (a) the terminology to be used;
- (b) the method to be applied or the procedure to be followed;
- (c) the material to be used;
- (d) any requirements to be met,

in connection with the execution in an orderly, systematic, practical, efficient, safe or effective manner of an act performed with a view to achieving a stated purpose or obtaining a stated result ... In short Codes of Conduct regulate behaviour. Codes of Practice regulate engineering practice. (2006b: 1)

However ECSA also notes that a code of practice has been variously described as the rules established by regulatory bodies, which are intended as a guide to acceptable behaviour

and as

a document which details those professional standards and ethical values that the regulatory body expects all registered persons to adhere to ... (2006b: 1)

For example a code of practice may refer to the conduct considered to be proper and acceptable in certain situations, such as between engineers and their clients, or between engineers and their subordinates. Given all the above one may justifiably conclude that the distinctions between *codes of ethics*, *codes of conduct* and *codes of practice* are by no means hard and fast, and that the way in which they are used can vary from one role player to another.

Nevertheless, with the hierarchical structure of the PSDF in mind, it is here suggested that these terminologies may be interpreted as being reflective of a hierarchy in which a *code of ethics* refers to more foundational prescriptions, while a *code of conduct* and a *code of practice* refer to progressively more practical and workaday rules, which give effect to the higher level prescriptions. This hierarchical structure may also be evident in a single document issued by an organisation or a profession to cover the conduct of its members. While such a document could be headed by any of the already mentioned designations or variants of these, it would contain a range of prescriptions starting with those pitched at a higher level, and which are more foundational in nature, to those framed at a lower level and which aim to interpret the intentions of the higher level principles at a practical level.

In the light of all that has been said, it would be somewhat arbitrary to insist on a dogmatic

interpretation of the various designations. However, for the purpose of this study, a code of ethics and a code of conduct will be treated as synonyms, while a code of practice will be reserved for use at the practical level of methodology. And so, as it is the proper *behaviour* of engineers with respect to sustainable development that is under discussion in this chapter, the term 'code of practice' will not find much more application, while the terms 'code of ethics' and 'code of conduct' will be used frequently and interchangeably.

In summary then, a professional code of conduct (or ethics) may be described as a written document which lays down the ethical standards of conduct which the members of that profession are required to abide by. In virtually all such codes of conduct, and certainly those that apply to the engineering profession, the requirements of integrity, honesty, and fair dealing are prominent, as well as the requirement to pursue the benefit and safety of the public in all professional activities. In addition, in many instances, the code of conduct of an organisation or profession may, by way of one or more clauses, make provision for the ethical consideration of issues related to the *natural* environment. Such special 'environmental' clauses may even be contained in a separate document, named, for example, a *code of environmental ethics*. The intention of such a code will obviously be to prescribe the proper conduct of the members of the organisation or profession towards the natural environment. Codes of conduct can deal in a similar manner with the notion of *sustainable development*.

In the further discussion on codes of conduct which is to follow, frequent references will be made to the *environment* and to *sustainable development*, and thus it is necessary to briefly outline the relationship between these two concepts as it will apply in this discussion. The development of environmental awareness in general started with a focus on the natural environment, which then developed into a broader conceptualisation that included social issues, as was explained in Chapter 1. Sustainable development applies to this broader conceptualisation of the environment. Engineering thinking in this regard has followed a similar trend. Many earlier engineering documents spoke of, for example, an *environmental* code of conduct, and in these the focus fell mainly on the natural environment. Later documents would speak of, say, guidelines for *sustainable development*, and their scope would include the natural environment, but also extend beyond that. However this generalisation was by no means universal as neither the headings nor the content of these documents were prescribed, but most

often simply the result of the predilections of their authors. Therefore, in the next sub-section, it is not considered necessary to make a hard distinction between the use of these terms, and indeed sometimes the combined designation, *environment/sustainability*, will be used.

In the overview of engineering codes of ethics to follow, the more general aspects of these codes will only receive cursory attention, while, in line with the focus of this study, most of the emphasis in the discussions will fall on such clauses or codes which are applicable to the environment and/or to sustainable development. A number of such clauses and codes from countries around the world will be reviewed, and where applicable compared to the PSDF, as set out in Appendix F. The implication here is that if the PSDF is to be broadly applicable and comprehensive, it cannot contradict the general statements of conduct to emerge from the reviewed codes. Rather, one would hope, it would have enough scope to, either explicitly or implicitly, endorse such statements.

### **10.2.2 Overview of various engineering codes of conduct with respect to their environmental and sustainability prescriptions**

While it has been considered unnecessary to engage with the full content of the various engineering codes of conduct included in the overview, it may be mentioned in passing, that it is evident that most of the codes cover the same general elements. These include, *inter alia*, the promotion of the health and welfare of the public, the proper relationship between engineers and their clients, the restriction of only doing work one is competent in, the commitment to continued professional development, and the pledge to uphold the honour of the profession. Given the wide scope of sustainable development, even some of the above elements are not beyond its full ambit, but it is the stated intention of this study to focus mainly on those parts of the codes that relate directly to the environment and sustainability. As could be expected, references to the environment and sustainability only started to appear in engineering codes of conduct when society in general became more environmentally aware, and that was in the latter years of the previous century. It is also noticeable that as the engineering codes of conduct were updated, the clauses dealing with environmental and sustainability issues became

increasingly more elaborate and mandatory.<sup>353</sup> In line with these developments some engineering bodies went so far as to issue separate codes that dealt exclusively with the ethical issues in relation to the environment and sustainability.

The following discussion will commence by reviewing the codes of conduct of various major engineering organisations from across the world, with, as has been said, particular reference to their environmental/sustainability components. And then the discussion will be concluded with an overview of the corresponding situation in some African countries, with particular emphasis on the situation in South Africa.

#### *10.2.2.1 The American Society of Civil Engineers*

The American Society of Civil Engineers (ASCE) is probably the largest body of civil engineers in the world. It has around 140000 members worldwide, of which the bulk are, of course, US citizens. The *ASCE Code of Ethics* is a tiered document consisting of Fundamental Principles at the top tier, followed by Fundamental Canons, and each of these are then further explicated through a set of Guidelines to Practice. Given the strength and influence of ASCE in world engineering, their code of ethics has been chosen as exemplar of a professional engineering code of ethics, and as such it has been reproduced in full in Appendix M1. In the following discussion however, attention is limited to issues of the environment and sustainable development, and these are dealt with in Fundamental Principle 1 and Fundamental Canon 1. Fundamental Principle 1 calls on civil engineers to use “their knowledge and skill for the enhancement of human welfare and the *environment*” [emphasis added], and in support Fundamental Canon 1 then states:

Engineers shall hold paramount the safety, health and welfare of the public and shall strive to comply with the principles of *sustainable development* [emphasis added] in the performance of their professional duties. (ASCE, 2010a: 1)

In the relevant guideline (1.f) the sustainability aspect of Canon 1 is further elaborated on as follows:

Engineers should be committed to improving the environment by adherence to the principles of sustainable development so as to enhance the quality of life of the general public. (ASCE, 2010a; 2)

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<sup>353</sup> This conclusion is tempered somewhat by what might appear to be a slight retreat in the latest versions of some of the codes.

The principles of sustainable development, if they are spelt out elsewhere, are not part of the code of ethics, and this renders the above prescriptions somewhat toothless. Furthermore it follows from the fundamental principle, the canon and the guideline that ASCE does not assign intrinsic value to the natural environment and that sustainable development is only practised to “enhance the quality of life of the *general public*” [emphasis added]. From the perspective of many environmental theorists, this anthropocentric bias that ASCE imposes on the notion of sustainable development, will be viewed as regrettable. One may explore this perceived inadequacy further by going back to the ASCE definition of sustainable development. ASCE has, in fact, defined sustainable development variously. In its *Code of Ethics* the following definition is offered:

Sustainable Development is the process of applying natural, human, and economic resources to enhance the safety, welfare, and quality of life for all of the society while maintaining the availability of the remaining natural resources. (ASCE, 2010a: 7)

An earlier definition appeared in the ASCE document: *Ethics. Guidelines for Professional Conduct for Civil Engineers*.

Sustainable Development is the challenge of meeting human needs for natural resources, industrial products, energy, food, transportation, shelter, and effective waste management while conserving and protecting environmental quality and the natural resource base essential for future development. (ASCE, 2008)

Neither of these definitions do much to dispel the perception that ASCE views the natural environment simply as a resource base to be used in meeting human needs. The environment is to be conserved, essentially because it is a resource for humans, present and future, and apparently not because it is valuable in and of itself. In the last mentioned ASCE document, environmental protection features only as a relatively short, single paragraph in the fourteenth out of fifteen guidelines, and the definition of sustainable development only features in a footnote.<sup>354</sup> While it might be unfair to judge the importance of the natural environment and sustainability to ASCE on the basis of a number of paragraphs in a document, it would, on the other hand, not be easy to argue, from the said document, that sustainable development is or should, in ASCE’s view, be a main plank of engineering. But then there are other ASCE

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<sup>354</sup> This applies to the *ASCE Code of Ethics* as well.

documents which may address these perceived shortcomings. Extracts from the *ASCE Policy Statement 418* (ASCE, 2010b), as was previously quoted (see §10.1), stress the leading role and responsibility that engineers have in respect of sustainable development. Furthermore, it can be said that this document displays a more holistic perception of sustainable development, as it recognises

the reality of limited natural resources, ... the need for social equity in the consumption of resources ... [and that e]nvironmental, economic, social and technological development must be seen as interdependent and complementary concepts". (ASCE, 2010b)

Based on inputs made by engineering bodies to the World Summit on Sustainable Development (WSSD) held in Johannesburg in 2002, and on some of the outcomes of the WSSD, the Committee of Sustainability of ASCE, produced a report, *Sustainable Engineering Practice. An Introduction*, which, in the form of a 127-page booklet, sets out to be “a ‘primer’ on sustainability” aimed at “engineering students and young engineering professionals in practice” (ASCE, 2004: v). One could take issue with the fact that the report is aimed at *young* engineers, whereas it could be argued that it is often the more established practitioners who are in need of new thinking. While the more senior coterie of engineers do have more influence in shaping engineering practice, they are also more likely to have been schooled, and so set in the traditional (inadequate) paradigm that they fail to appreciate the fundamental shift in focus needed to make sustainability a core element of engineering practice. Even the use of the phrase ‘sustainable engineering practice’ in the title is worrisome, as it is not engineering practice, as such, that should be sustained, but rather that engineering practice should be so transformed that sustainability becomes an integral part of it. More correctly one should rather speak of ‘sustainability engineering’, but given the frequency with which the phrase ‘sustainable engineering’ is used in engineering publications, one suspects that the authors are not sensitive to this variation in nuance (or are concerned about it).<sup>355</sup> The ASCE booklet also speaks of sustainability being “a vision, an ethic, *not* a strategy and supporting tactics, *not* a set of specific technologies, processes, laws, regulations or standards” (ASCE, 2004: v-vi; [emphases added]), but that is not the view taken in this study. It is argued here that for sustainability to move away from the vagueness which is often its weakness, *all* of these aspects have to be incorporated into a coherent and integrated approach. That is what the PSDF attempts to do. It is also

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<sup>355</sup> The same problem also occurs in other fields, e.g. sustainable agriculture, sustainable business, etc.

believed that a more logical and powerful understanding of sustainability is, to see a sustainable society as the vision, and sustainable development as the strategy employed to get there.

The fact that the booklet, *Sustainable Engineering Practice. An Introduction*, was drawn up by a committee, and that to a large extent, it is based on extracts from various other documents produced by other engineering organisations,<sup>356</sup> probably contributes to its lack of cohesion and structure, and hence reduces the impact that it could make as an unambiguous guideline or manual on sustainable development. In many respects it appears as if ASCE is trying to be not too restrictive. While many of the actions and proposals reported on in the ASCE booklet are worthy and commendable, and undoubtedly represent an advance in the progress towards sustainability, the more pertinent question as to whether these actions in fact *ensure* sustainability, remains open. For example, does a “commitment to reduce biodiversity loss by 2010” (ASCE, 2004: 9), while laudable, say enough to guarantee (to the extent that one can) sustainability? And does the statement that the “goals of consulting engineers should include a commitment to achieve sustainable development” (ASCE, 2004: 94), without further elaboration, command sufficient authority to ensure its realisation? While acknowledging the pioneering value of the ASCE booklet in explicating sustainable development, it is not a code of conduct (it is after all only aimed at young engineers and students), and so it is to the *ASCE Code of Ethics* that one may return in the expectation of finding a more authoritative statement on sustainability.

In dealing with a contestable subject such as sustainable development, there is a fine line between being too open-ended and too prescriptive. With respect to the principles of sustainable development the *ASCE Code of Ethics* (2010a: 1) says that engineers should “strive to comply” – that is rather open-ended. The view held in this study is that if being too prescriptive is to err, it would be a case of erring on the safe side. Hence its promotion of sustainable development as a canon of engineering, rather than a ‘nice to have’. A brief statement in a code of ethics or conduct may be acceptable if it deals with well recognised and established concepts. For example, the call to be “honest and impartial” in the *ASCE Code of Ethics* (ASCE, 2010a: 1) may be seen, despite its brevity, as a powerful statement, because honesty and impartiality are well-known and well-established concepts in society. On the other

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<sup>356</sup> The views of some of these other organisations will be dealt with separately here below.

hand, it is precisely the vague and contested nature of sustainable development as a concept, that demands more elaborate wording or a supportive framework if it is to be more than a somewhat hollow ideal.

Vesilind and Gunn (1998b) see the emergence of an environmental ethic through the various versions and editions of the ASCE code of ethics, as the outcome of a contest between progressive and conservative positions. This contest often resulted in compromises, the outcomes of which fell short of the ideal from a sustainability perspective. Thus, even in the present 2010 code's Canon 1 and its guideline 1(f) (as quoted here above) do they find space for improvement.<sup>357</sup> Referring to Canon 1<sup>358</sup> they comment as follows:

On the surface, ASCE has taken a giant step forward in incorporating environmental values into its *Code of Ethics*. But let's look at this more closely. Consider the wording. The engineer *shall* (that's a good start) *strive* (meaning that the engineer has to try, not actually do) *to comply with the principles of sustainable development*. But nowhere in the Code are the principles of sustainable development spelled out.

Principles of sustainable development are not like the laws of thermodynamics, or regulations on stream quality, or traffic laws. Civil engineers wishing to practice in concordance with their society's *Code of Ethics* are apparently free to determine what in their opinion are the principles of sustainable development, and then all the *Code* asks of them is to strive to act so as to be in line with what they themselves determine to be these principles. (Vesilind & Gunn, 1998b: 73)<sup>359</sup>

And with respect to the supporting Guideline 1(f)<sup>360</sup> they continue their critique as follows:

Ignoring the curious reference to the "general" public (who else is there?), the key word is of course "should". Even though the Fundamental Canon says "shall", the guideline lets the engineer off the hook by suggesting that "should" is good enough.

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<sup>357</sup> While Vesilind and Gunn were actually critiquing the 1997 version of the ASCE Code of Ethics, these two particular sections of the code have remained unchanged between 1997 and 2010, and the criticisms of Vesilind and Gunn thus still remain valid.

<sup>358</sup> Canon 1 is repeated here for ease of reference:  
Engineers shall hold paramount the safety, health and welfare of the public and shall strive to comply with the principles of sustainable development in the performance of their professional duties. (ASCE, 2010a; 1)

<sup>359</sup> The argument by Vesilind and Gunn that the principles of sustainable development should be spelt out more clearly, will be carried further in the proposals to be made later in this chapter.

<sup>360</sup> Guideline 1(f) is repeated here for ease of reference:  
Engineers should be committed to improving the environment by adherence to the principles of sustainable development so as to enhance the quality of life of the general public. (ASCE, 2010a; 2)

The cynic would say that once again the American Society of Civil Engineers has changed its Code of Ethics to enhance its public image and not to effect a meaningful change in the actions of civil engineers. (Vesilind & Gunn, 1998b: 73)

They, Vesilind and Gunn, are not unaware of the fact that the ASCE members (and for that matter, many other engineers like them) who draft the environmental statements that appear in their (respective) code(s) are “seriously trying to cope with environmental problems ... [while] balancing the rights and benefits of humans and the nonhuman environment” (1998b: 74). These statements are simply the best compromises that could be achieved at the time of drafting. But as a public document a code is open to criticism, and indeed it is the duty of concerned individuals to scrutinise the codes for potential weaknesses. And so the intention is not to denigrate, but rather to suggest, that while there may be the real tensions that engineers (inside and outside of ASCE) have to grapple with in dealing with the realisation of sustainable development, there are possibly better ways of managing these tensions. A modest suggestion might be, that instead of dealing with sustainability as one of a number of ideals included in a single sentence, it could be better accommodated in a separate section or even a separate code.

#### *10.2.2.2 The World Federation of Engineering Organisations*

Vesilind and Gunn (1998b: 74) conclude their article (quoted here above) by recommending that the work done by the World Federation of Engineering Organisations (WFEO) be considered as the basis for further progress towards a fuller integration of sustainable development into engineering practice. The WFEO, being an international body to which national engineering bodies are voluntarily affiliated, has a certain freedom in expression, that maybe the national bodies do not have. National engineering bodies, which are collectives of, essentially practising, engineers, are probably more restrained by the predilections of their members. Thus one could perhaps expect the WFEO to be more innovative in its ethical prescriptions, particularly in relation to the evolving sensibilities around the environment and sustainability. They have indeed produced a model code of ethics that, in their words, can “be used to define and support [the] creation of codes in member institutions” (WFEO, 2001: 1). On the down side, however, is the fact that the WFEO, being only a voluntary association of engineering organisations, has no direct control over individual engineers, and with respect to engineering institutions, its power resides essentially in advocacy. As is to be expected, the *WFEO Model Code of Ethics* addresses many of the general issues that also appear in other

engineering codes of ethics, such as the already discussed *ASCE Code of Ethics*,<sup>361</sup> to name one. In addition, the WFEO model code has a separate section devoted to environmental engineering ethics. This section, being of particular pertinence to this study, is reproduced in Appendix M2.

Before moving on to a discussion of this section on environmental engineering ethics in the WFEO model code, it is relevant to note the WFEO's view on ethical principles in general. In the introduction to their model code they say:

These principles are usually presented either as broad guiding principles of an idealistic or inspirational nature, or, alternatively, as a detailed and specific set of rules couched in legalistic or imperative terms to make them more enforceable. Professions ... have tended to opt for the first alternative ... As a consequence, a code of professional ethics is more than a minimum standard of conduct; rather, it is a set of principles which should guide professionals in their daily work. (WFEO, 2001: 1)

Given this point of departure it is clear that the WFEO's model code will supply principles at a level of generality that *guides* rather than prescribes. *Guidance* does tolerate some interpretative space, and in situations of ambiguity and contestation this can be problematical. The opinion held here is, as was previously stated, that this approach is acceptable with respect to well-established values such as honesty and integrity, but when it comes to a contestable concept, such as sustainable development, more circumspection is needed. The lack of specificity in a code around such ambiguous concepts could lead to dubious practices. In the case of sustainable development, certain practices dubbed as sustainable might in fact not be so, or only be marginally so. An extension of this criticism is the problem of imprecise formulation (as was commented on by Vesilind and Gunn with reference to the ASCE code). In the section on environmental engineering ethics of the WFEO code, it is said, for example, that engineers should “*try* to the best of their ability ... to obtain a superior technical achievement”, that they should “*strive* to accomplish beneficial objectives”, and that they should “*be aware* ... [of] the principles of eco-systemic interdependence” (2001: 2; [emphases added]). Is ‘trying’, ‘striving’ and ‘being aware’ enough to ensure sustainability? Environmentalists, particularly those who judge engineering practices as being inherently

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<sup>361</sup> Canon 1 of the ASCE Code of Ethics (see it in footnote 358), for example, corresponds with the following clause from the WFEO Model Code of Ethics:

Professional engineers shall hold paramount the safety, health and welfare of the public and the protection of both the natural and the built environment in accordance with the Principles of Sustainable Development. (WFEO, 2001: 2)

harmful to the environment, will not be much comforted by such tentative phraseology in an engineering code of ethics. As a further example, consider the principle of equity that many regard as foundational to sustainable development; the WFEO merely expects engineers to “*discuss ... the consequences of their proposals and actions*” in this regard (WFEO, 2001: 2; [emphasis added]). Other important principles of sustainability, such as the principle of precaution, the user pays principle and the carrying capacity principle, receive little or no prominence in the WFEO Code.

In reviewing the WFEO Model Code of Ethics, it is commendable that they include a seven-point, separate section focussed specifically on the environment and sustainability, but it is felt that the thrust of this section is too tentative and the scope too limited. It must be said that the Model Code is more than ten years old, and it is quite possible that if the WFEO were to revise this document in the light of the present conditions, it would re-emerge with a stronger endorsement of sustainable development. In comparing the WFEO model code with the PSDF (which, as it stands is not a code of ethics, but it does contain a set of sustainable development principles), the latter comes across as far more comprehensive, detailed, and if needs be, prescriptive.

#### *10.2.2.3 The Institution of Civil Engineers*

The main home for civil engineers in the UK, and for many in the Commonwealth of Nations, is the London-based Institution of Civil Engineers (ICE). As one could expect, they have produced their own code of conduct, called the *ICE Code of Professional Conduct* (ICE, 2010a) which is supported by a separate document entitled *Advice on Ethical Conduct* (ICE, 2010b). The ICE code is very brief, consisting only of six rules, but these are amplified, in the same document, by some ‘Guidance Notes’. Again most of the typical conditions listed in an engineering code of conduct appear here too, but of more interest here is Rule 3 that deals with some general aspects of sustainable development, and Rule 4 that deals more specifically with the natural environment. These rules read as follows:

3. All members shall have full regard for the public interest, particularly in relation to matters of health and safety, and in relation to the well-being of future generations.
4. All members shall show due regard for the environment and for the sustainable

management of natural resources. (ICE, 2010a: 2)

While both of the above rules enjoy the benefit of the imperative ‘shall’ it is only Rule 3 that is further amplified in the ‘Guidance Notes’, where it is explained, *inter alia*, that “full regard for the public interest” implies not only adherence to the relevant legislation as a minimum requirement, but also the consideration of broader issues, such as the quality of life of the affected individuals, and their cultural and ethnic heritage. As has been said, Rule 4 is not expanded on in the ‘Guidance Notes’, but it does receive some further amplification in the *Advice on Ethical Conduct* document. However this amplification, as well as the whole document for that matter, is emasculated by a general rider which states that “a member’s failure to adhere to the guidance [given in this document] is unlikely, of itself, to constitute a breach of the Rules of Professional Conduct” (ICE, 2010b: 1). Further erosion of the advice given in respect of Rule 4 comes about as a result of imprecise wording again. There is, for example, liberal use of phrases such as “should promote”, “wherever practicable”, and “take account of”. This criticism of the cursory treatment given to the environment and sustainability in the ICE code must be tempered by the fact that the ICE has produced, in addition to their code of conduct (and in collaboration with other organisations), documents in support of the integration of sustainability into engineering practice, which contain far more detail and technical information. Of course these documents may lack the authority of a code of conduct, but at least they are considerably more specific in their pronouncements.

The ICE collaborated with the Association for Consulting and Engineering (ACE), the Civil Engineering Contractors Association (CECA), CIRIA<sup>362</sup> and the Construction Products Association (CPA) in producing a 20-page document entitled *Sustainable Development Strategy and Action Plan for Civil Engineering* (ICE, *et al.*, 2007). In this document it is acknowledged that “the current approach to development ... remains essentially unsustainable” and that “there is a strong sense of imbalance in the delivery of civil engineering” (ICE, *et al.*, 2007: 5). It is in response to these perceptions that the ICE and its partners have produced this strategy and action plan. This document starts with the usual definitional approach and then also endorses the three-dimensional conceptualisation of sustainable development, both as represented by intersecting circles (see Figure 6.3) and by nested circles (see Figure 7.1). It

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<sup>362</sup> This is the construction industries research and information association.

formulates its vision as follows:

Our vision is for the civil engineering industry and profession to play its full role in the creation and maintenance of sustainable communities in harmony with their natural environment. (ICE, *et al.*, 2007: 12)

This vision corresponds, in essence, to the vision used in the PSDF (see Appendix F), and as such adds legitimation to this aspect of the PSDF. Further correspondences between the strategy document and the PSDF, not only reinforces the PSDF more broadly, but it also (the broad sourcing of the PSDF notwithstanding) underscores the relevancy of the PSDF to the civil engineering profession in particular.

The strategy document of the ICE, *et al.* proceeds from its vision to four general aims for action. These are to:

- 1 Promote strong leadership for sustainable development within civil engineering ...
- 2 Embed the principles of sustainable development within civil engineering ...
- 3 Build capacity for sustainable development in civil engineering ...
- 4 Create and influence a policy framework that demands more socially and environmentally responsible behaviour. (ICE, *et al.*, 2007: 12)

One could assume, given the broad authorship of this strategy document, that these aims are representative of the civil engineering leadership in the UK. And given the commonalities between civil engineering practices in UK and in those countries whose historical industrial roots are largely British, there is no reason to think that these aims would not also be reasonably relevant to the civil engineering professions in these countries. Thus they can also be said to be relevant to South Africa, even if it is accepted that the developmental demands of South Africa may introduce additional priorities. Under this assumption one could argue that aims 1 (partially) and 2 of the ICE strategy document are covered, with possible editorial amendments of no great significance, by the PSDF. Aim 3 is in a large measure focussed on integrating sustainable development into civil engineering education and that will, in the South African context, be considered in the next chapter (see §11.3). The realisation of this aim will also indirectly promote aim 1. The policy framework as envisioned in aim 4 of the ICE strategy, one could contend, given the policies as discussed in Chapter 8, is well advanced in South Africa,

even if the civil engineering profession in this country still has to engage with them. Thus it could be argued that the aims contained in the ICE strategy document, if transferred to South Africa, could be, or are being, adequately addressed in one way or another.

The ICE and its partners see the “sustainability-driven approach to civil engineering” being expressed in practice through key objectives such as the following:

- dramatically reduce the environmental impact of our life and work
- dramatically improve the environmental quality of what we create
- maximise the utilisation of materials and their reuse
- maximise appropriate use of secondary and recycled materials
- minimise waste in design, construction and use
- minimise energy and water use
- minimise pollution from all our activities
- focus on increasing peoples’ quality of life through good urban design
- ensuring respect for people; that is, showing care towards the workforce and the surrounding community. (ICE, *et al.*, 2007:9)

It is abundantly clear that all of these objectives are comfortably covered by the principles articulated in the PSDF, and so once again one can have confidence not only in the relevancy of the PSDF itself, but also, it now seems, in its capacity to adequately underpin a sustainability guideline/code for the civil engineering community in SA.

The ICE, *et al.* conclude their strategy document with an action plan that stipulates specific objectives, the actions that need to be taken with regard to each objective, and the driver and time scale for each. As an example, one such objective/action pairing is illustrated in Table 10.2 below.

TABLE 10.2: EXTRACT FROM THE ICE/ACE/CECA/CIRIA/CPA ACTION PLAN FOR SUSTAINABLE DEVELOPMENT IN CIVIL ENGINEERING  
(From ICE, *et al.*, 2007: 17)

<b>Aim 3: Build capacity for sustainable development in civil engineering</b>			
Building capacity for sustainable development is about equipping organisations and individuals with the understanding, skills and access to information, knowledge and training that enables them to perform effectively.			
<b>Objective</b>	<b>Actions and deliverables</b>	<b>Champion</b>	<b>Timescale</b>
8. To increase the capacity of current and future civil engineers and decision makers in the field of civil engineering to implement sustainable development ...	... 8.3 Work collaboratively to support the inclusion of sustainable development into the Higher Education teaching curriculum through: <ul style="list-style-type: none"> <li>– assessing the value of existing teaching resources</li> <li>– identifying gaps in the current provision</li> <li>– exploring how best to support academics ...</li> </ul>	ICE	June 2008

The reason for showing an extract from the action plan in the above table is twofold. Firstly it is to give a feel for the type of actions that are necessary to move the civil engineering industry into the sustainable development paradigm. It is also of interest to see the degree of specificity attached to the actions, and the serious intent behind them as revealed by the appointment of a “champion” and by the setting of a time scale. The wide scope of the ICE action plan becomes evident if one surveys its full complement of 12 objectives and 45 actions. The second reason for reproducing the extract in the above table, is to show that the action plan is not, commendable as it is, a code of conduct. The actions are specific, time bound and each has been made the responsibility of one of the bodies that authored the strategy document. A code of conduct, on the other hand, is of a more general nature in that it draws on widely valid principles.<sup>363</sup> The code of conduct will also have a bearing on the actions of *all* of the persons for whom the code has been drawn up (i.e. in the present context, engineers), and furthermore, a code also represents ongoing commitments, rather than time-based objectives. In a sense then one may regard the drawing up of an action plan, such as the one just discussed, as a subsequent stage after the code of conduct has been established, and a strategy formulated. One could assume that if the civil engineering community in South Africa were to adopt a sustainability code of conduct, then the following steps would be to devise a strategy and action plan in order to give more effect to the substance to the code.

<sup>363</sup> It has already been mentioned that in the case of a sustainability code of conduct, the tendency towards generalisations needs to be curtailed somewhat so as to counter the ambiguities around the concept of sustainable development.

A second instance of collaboration involving the ICE is notable not only for its sharper focus on sustainable development in *practice*, but also for the perspective that sees *cooperation between quite disparate professions* as a basic characteristic of sustainability practice. In this instance the cooperation was between the Institution of Civil Engineers and the Actuarial Profession, as they together commissioned a study on the incorporation of sustainable development principles into major infrastructural projects. This study was carried out by the Omega Centre at the University College of London, and some of the objectives of this study were:

- To identify and understand the strengths and weaknesses of current practices regarding the methods employed to address social and environmental considerations in the appraisal of major projects ...
- To develop and recommend a ‘good practice’ appraisal framework which takes into account the weaknesses and strengths of past appraisal methodologies and which incorporates new concerns of the 21st Century that set financial and economic risks and returns firmly against social and environmental risks and opportunities. (Omega, 2010: 3)

The latter objective led to the development of a multi-criteria analysis framework for appraising major infrastructure projects, and as such reaches a level of methodological detail which is beyond the intended scope of this study. It is nevertheless reported on here to illustrate firstly the need for interdisciplinary cooperation, and secondly to indicate how far the civil engineering profession, at least in the UK, has already moved down the road of sustainability.

#### *10.2.2.4 The Engineering Council of the United Kingdom*

Returning to a more focussed consideration of the topic of codes of conduct, the Engineering Council of the UK<sup>364</sup> (ECUK) has produced a set of guidelines for institutional codes of conduct. It contains fourteen such guidelines, but only one of these deals directly with sustainability – it states that engineers should act

in accordance with the principles of sustainability, and prevent avoidable adverse impact on the environment and society. (ECUK, 2011: 1)

This guideline, on its own, might once again seem rather meagre, but in this instance it is further amplified in a separate document, *Guidance on Sustainability*, which lists a further six

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<sup>364</sup> This body controls the registration of engineers and technicians in the UK

principles. These principles serve “to guide and motivate engineers when making decisions for clients, employers and society which affect sustainability”. The principles are as follows:

- 1 Contribute to building a sustainable society, present and future
  - 2 Apply professional and responsible judgement and take a leadership role
  - 3 Do more than just comply with legislation and codes
  - 4 Use resources efficiently and effectively
  - 5 Seek multiple views to solve sustainability challenges
  - 6 Manage risk to minimise adverse impact to people or the environment.
- (ECUK, 2009: 2)

Principle 1 corresponds to the vision of the PSDF, principle 4 to the efficiency principle of the PSDF, and principle 5 to the effective governance and corporate responsibility principles of the PSDF. Principle 2 assigns a leadership role to engineers in sustainability matters, a view which will be discussed in more detail here below, as will the issue of risk management (principle 6). Principle 3 only applies if the code sets *minimum* standards; if it sets idealistic standards then the need for this principle is reduced if not removed altogether.

This *Guidance on Sustainability* document replaces a code of professional practice published in 1993 and entitled *Engineers and the Environment* (EC, 1993), and which was supported by an extensive 56-page document entitled *Guidelines on Environmental Issues* (EC, 1994). This sequence of code and guideline documents indicates firstly, a broadening of focus from a more narrow concern with *environmental* issues, to a more inclusive *sustainability* perspective, the manifestation of a trend that has previously been pointed out. Secondly, there also seems to be a withdrawal from a quite detailed and extensive set of guidelines to a much shorter set of principles. This latter trend may have been seen as a retrogression were it not for the elaboration of these principles through a number of sub-clauses attached to each principle.<sup>365</sup> These principles and their sub-clauses are here designated, in short, as ‘the ECUK Principles’.

The ECUK Principles are reproduced in Appendix M3 in tabular form, which allows easy comparison with the principles of the PSDF. Again it will be seen that a close correspondence can be drawn between the two sets of principles. However there are two aspects of the ECUK principles that are not reflected in the PSDF, and hence deserve some further comment. Firstly,

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<sup>365</sup> While these trends towards generalisation around the concept of sustainability have been warned against, it is probably a natural result of the broadening of the sustainability perspective over time.

it is very evident from Principle 2 and also a number of the sub-clauses in the ECUK suite (marked \*1 in Appendix M3), that the engineering profession is given a special responsibility and even a leadership role in the operationalisation of sustainable development. Given that some regard the past performance of engineers in conserving the environment and promoting sustainability as less than exemplary, it is likely that this special status, which engineers appropriate to themselves, may be disputed. However the importance which engineers attach to their role in sustainable development, self serving though it may seem, arises from the obvious fact, which has already been alluded to previously, that engineering projects can and do have a major impact on the environment. Furthermore it is not so much a special status, but rather a special *responsibility* which is assigned to engineers in this regard. Thus it is concluded here that a sustainability code of conduct for engineers would have to emphasise this special responsibility.

The second aspect of the ECUK Principles that merits further comment here relates to those sub-clauses (marked \*2 in Appendix M3) that touch on the incompatibilities and uncertainties which arise in sustainability assessments, and hence the risks that may be associated with them. These are very real problems encountered in practice, brought about mainly by the holistic perspective which sustainable development requires, and also the difficulty in measuring sustainability and setting appropriate norms. It is felt that PSDF could be improved by pointing out these problem areas within its framework. And so in Principle 5.5 two phrases have been added to reflect these issues (see Appendix C16).

#### *10.2.2.5 Engineers Australia*

The body that represents engineers of all disciplines in Australia is known as *Engineers Australia* (EA). As is the case with the engineering bodies discussed thus far, it has its own code of ethics, which again covers such general objectives as honesty, integrity and competence. It has four sections, the fourth of which deals pertinently with the notion of sustainability, and it reads as follows:

#### **4. PROMOTE SUSTAINABILITY**

- 4.1 Engage responsibly with the community and other stakeholders
- 4.2 Practise engineering to foster the health, safety and wellbeing of the community and the environment
- 4.3 Balance the needs of the present with the needs of future generations. (EA, 2010: 1)

Already in this brief statement it can be seen that the environment is accorded more value than simply being a store of resources for human use. A hint of intrinsic value comes through in the call “to foster the ... wellbeing of ... the environment”. But having said that, the above extract, on its own, might again (as was the case with some of the codes previously discussed) be considered to be somewhat lean. It may be worth repeating that, for some theorists, the transition from current development practices (including engineering practice) to sustainable development practice, is deemed to be of the order of a paradigm shift, thereby implying that something more substantial than a sentence or two in the code of ethics is needed. But in defence of EA, it can be said that they have produced, in addition to the above mentioned section in the EA code of ethics, a more extensive *Sustainability Charter* that offers a bolder and more detailed exposition of their sustainability ideals. Here then can be found statements that apparently reflect a greater commitment to strong sustainability, than what has thus far been evident in this overview of codes. For example the *Sustainability Charter* states:

Engineers Australia believes that sustainable development should be at the heart of mainstream policy and administration in all areas of human endeavour. (EA, 2007: 1)

And also:

Engineers Australia believes that achieving sustainable development requires a fundamental change in the way that resources are used and in the way that social decisions are made. (EA, 2007: 1)

Given that the Australian economy is pre-eminently Western, one might understand why this document also contains a commitment to “the application of market principles”. But, as tensions and conflict often exist between market forces and environmental objectives, it might, for some, be a problematical commitment. However, sustainable development (as here understood) does not in principle rule out the value of market forces, provided that their impacts are holistically understood and appropriately handled. And in any case, in the EA charter a rider is added which acknowledges that “[m]arket mechanisms will in some circumstances be inappropriate” (EA, 2007: 1).

The EA *Sustainability Charter* was preceded by what appears to be a far more detailed sustainability code, a booklet entitled *Environmental Principles for Engineers*, issued in 1992.

While the objectives of the two documents might be somewhat different, the first having more of a general aspirational nature, and the second being more geared towards engineering practice, the apparent regression in terms of focus and prescriptiveness from the *Principles* booklet to the *Charter* document, seems to echo the trend picked up on earlier. This trend might explained, in the Australian context, by the perception that earlier sustainability initiatives

unduly emphasized environmental concerns. The result was that ecologically sustainable development began to be seen as an impediment to development generally instead of the balance between economic, social and environmental considerations envisaged in the Brundtland understanding. At a national level a period of policy hiatus ensued, with the emphasis firmly on economic development and increasing the competitiveness of the Australian economy, and this has only begun to change in recent years. (Hartley, undated: 2)

The mention of *environmental* principles in the name of the booklet referred to here above, together with its endorsement of the more limited notion of *ecologically* sustainable development, gives the impression of it being focussed mainly on the natural environment. But this impression is soon dispelled by the booklet's prominent call for the establishment of a "sustainability ethic" and its extensive treatment of the concept of sustainable development in its Section 3 (IEA, 1992: 1 & 7-9). Given this sustainability orientation and the fact that it makes some challenging demands, specifically for engineering practice, merits it being scrutinised more closely.

For a start one may, from the introduction in this booklet, note:

- that the authors see engineers as having a particular obligation toward sustainable development (as has been suggested earlier in this chapter),
- that they have formulated these principles for engineering practice, and
- that the principles, as such, aim to complement the code of ethics of EA (IEA, 1992: 1).<sup>366</sup>

The fact that these principles, formulated for engineering practice, were produced as ethical tenets, underline their perceived importance. In this vein the authors of the booklet assert:

For human survival, it is critical to ensure that future development is sustainable.

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<sup>366</sup> *Environmental Principles for Engineers* was published by the Institution of Engineers Australia (IEA), but this body has more recently adopted the appellation of *Engineers Australia* (EA), and hence, for reasons of consistency, the abbreviation EA will be used throughout in the text of this report.

Engineers need to develop a ‘sustainability ethic’, for without this, sustainable development will not be achieved. (IEA, 1992: 6)

But it appears that the *Environmental Principles for Engineers* booklet did not have much of an impact on engineering practice in Australia, and this reason probably contributed to the issuing of the later *Sustainability Charter*. Of the *Environmental Principles for Engineers* booklet Codner says that

there is almost a total lack of translation of [its] concepts into actions to achieve sustainability. This lack of action is attributed to two basic reasons – first, a lack of understanding of and commitment to sustainability, and second, that the way to translate sustainability ideas into specific actions is not understood and is difficult, particularly at the level of the individual engineer. (1995: 54)

A further contributory reason for the seemingly luke-warm implementation of the *Environmental Principles for Engineers* is that they, in some respects, seem to downgrade the status and expertise of engineers. For example consider the following two principles:

Engineers need to ...

- 2.1 Recognise that the expertise required for carrying out a specific engineering activity may not be sufficient for judging the environmental implications of that activity. ...
- 2.3 Recognise individual limitations in assessing environmental effects, and respect other professional opinions. (IEA, 1992: 2)

While attention has already been drawn to the fact that in a number of engineering publications ascribe a leadership position to engineers with respect to sustainable development, the above extracts, on the contrary, seem to aim for a more modest status.

A further reason why the *Environmental Principles for Engineers* publication has not proved very popular may be (as Codner hinted at in quotation above) some of the exacting demands it contains. Consider the following principle from the booklet:

Engineers should ...

- 4.6 Decline to be associated with engineering activities if the client or employer is unwilling to support adequate efforts to evaluate environmental issues or to mitigate environmental problems. (IEA, 1992: 3)

Principle 4.6 sets, what might be considered, a very idealistic standard; a standard which some would regard as quite unrealistic. In a competitive, commercial world it would only be

professionals of very strong moral conviction who would turn away potential clients in the knowledge that others might accept them, and thus in the process not only gain a market edge, but also a financial advantage.

It is these exacting demands made on engineering practice in the *Environmental Principles for Engineers* booklet, that suggest that the PSDF could profit from a direct comparison with these principles, if it, the PSDF, is to be considered a serious statement on sustainable development. For this reason these principles are reproduced in full in Appendix M4, and again in a tabular format so as to facilitate the comparison with the PSDF. Two conclusions may be drawn from this comparative table. The first is that the PSDF has a broader array of principles than the *Environmental Principles for Engineers*. It appears that the PSDF principles seem to be more comprehensive, particularly with regard to the social, economic and institutional domains,<sup>367</sup> which implies that the *Principles* booklet, its strong sustainability tenor notwithstanding, probably favours environmental issues (at least in terms of the number of principles with this focus).<sup>368</sup> One could thus argue that the broader scope of the PSDF represents a more balanced version of sustainable development.

The second conclusion is drawn from the comparison between the *Principles* booklet and the PSDF, is that the former is more engineering orientated. This is not surprising given that the *Principles* document was written for engineers. It focusses more specifically on *engineering practice*, whereas the PSDF has a more general orientation. It is particularly the relationship between engineers and their clients, with respect to environmental issues, that is stressed in the *Principles* document. One may therefore further conclude that, if the PSDF were to be the basis of a proposed sustainability code of conduct for engineers, it would probably have to pay more attention to the engineer/client relationship. With these comments one may conclude that there is otherwise a good correlation between EA *Principles* and the PSDF.

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<sup>367</sup> For example, the fairness and dignity principles in the social domain, the sufficiency and user pays principles in the economic domain, and the democracy and effective governance principles in the institutional domain all receive at best only implicit attention in the *Environmental Principle for Engineers* booklet.

<sup>368</sup> This is not all that surprising given that the booklet was published at the time when most sustainability publications tended to favour the natural environment, and it is in any case designated as 'Environmental' principles.

#### 10.2.2.6 Institution of Professional Engineers New Zealand

In 1993 the Institution of Professional Engineers New Zealand (IPENZ) adopted their own *Environmental Principles for Engineers* (IPENZ, 1993), based almost entirely on the EA document of the same name. Hence many of the comments made here above on the EA document apply equally to the IPENZ version. And after the publication of the *Principles* document in New Zealand there seems to have been, as in Australia, a hiatus with respect to the integration of sustainability into engineering practice. Gerald Coates, the IPENZ President, 2003-2004, expresses it as follows:

It seemed to me that sustainability had fallen off the back of the engineering truck, so to speak. It wasn't that engineers didn't care about it – it's just that it was a difficult nut to crack in their everyday work, and clients weren't pressing them, so it got overlaid with other things in their “pending” basket. Perhaps they even relabelled it the “too hard” basket. (2004: 1)

In response to this slow down in sustainability initiatives, IPENZ set up a Presidential Task Committee on Sustainability, under the leadership of Coates. They produced a report named *Sustainability – a task for engineers*, that aimed at moving engineering practice further along the road to sustainability. In their view:

Sustainability has major implications for engineers. Long term thinking on resources and paradigm shifts in economics and technology design are necessary. Improving the quality of life without merely increasing the quantity of goods is required. Engineers must become more effective at identifying real needs rather than wants, particularly technology driven “needs”. This will require them to become problem framers, so they help decide on the most effective directions that technology takes. (Coates, *et al.*, 2004: 4)

With this mind-set, and the objective of raising “the consciousness of engineers in terms of applying sustainability principles in their daily work and thinking” (Coates, 2004: 1) the Task Committee then formulated three principles of sustainability, each of which were further augmented by a set of guidelines, seventeen in total. Out of these flowed four key sustainability factors for engineers that were formally taken up into an *IPENZ Practice Note* (IPENZ, 2005b: 2-3). This Practice Note takes as its point of departure the *IPENZ Code of Ethics* which calls for “Sustainable management and care for the environment” as one of its five fundamental ethical values (IPENZ, 2005a: 1).

It is interesting to note that the *IPENZ Code* (IPENZ, 2005a) itself consists of three sections; the first being the already mentioned five ethical values, and the second consisting of guidelines

which “are offered as a guide to the understanding and intentions” of the values listed in the first part. The third part of the *IPENZ Code* “sets out the minimum standards of behaviour against which the behaviour of Members will be judged”. This imperative intent ascribed to Part 3 of the code is not fully reflected in the wording of its content. For example, with respect to the environment and sustainability, the wording appears less resolute and more tentative than the rhetoric employed in Part 1 of the code. For example consider the modest wording of the following extract from Part 3 of the *IPENZ Code*:

A Member must, in the course of his or her engineering activities, –  
(a) *have regard* to reasonably foreseeable effects on the environment from those activities; and  
(b) *have regard* to the need for sustainable management of the environment.  
(IPENZ, 2005a: 3; [emphases added])

In comparison the parent value in Part 1 of the *IPENZ Code* states:

Members *shall* recognise and respect the need for sustainable management of the planet's resources and *endeavour* to minimise adverse environmental impacts of their engineering activities for both present and future generations. (IPENZ, 2005a: 1; [emphases added])

Do the terms “have regard” and “shall” convey the same prescriptive message? But even in Part 1 of the *IPENZ Code* there is tentativeness; if engineers are only to “endeavour” to minimise the adverse environmental impacts of their activities, the end result on the ground may still be an increase in adverse impacts. A conclusion which may apply to many of the codes thus far is that the environmental and sustainability prescriptions in these codes tend to be somewhat diffident in terms of their prescriptiveness. And so, with this in mind, it might be more fruitful to turn the attention away from the *IPENZ Code* for the moment, and instead focus on the environmental principles and guidelines formulated by the Presidential Task Committee (Coates, *et al.*, 2004). These are reproduced in Appendix M5, where they are also compared with the principles of the PSDF. Once again it can be seen that PSDF principles correspond well to all the areas of the Task Committee document, and in this instance also with respect to the economic and institutional dimensions.

#### 10.2.2.7 *The International Federation of Consulting Engineers*

The International Federation of Consulting Engineers (FIDIC) has as its members national consulting engineering bodies, rather than individual engineers, and so it too, like the WFEO,

is less constrained by member predilections in terms of policy setting. Thus its Code of Ethics can boldly proclaim:

The International Federation of Consulting Engineers recognises that the work of the consulting engineering industry is critical to the achievement of sustainable development of society and the environment. (FIDIC, undated: 1)

And in view of this declaration FIDIC requires that consulting engineers shall seek “solutions that are compatible with the principles of sustainable development” (FIDIC, undated: 1). However, as could be expected, the FIDIC *Code of Ethics* is mainly concerned with the relationships between engineers and their clients, and also between fellow engineers, and as such it contains no further reference to sustainable development or the environment, other than the extracts which have already been quoted here above. Not unexpectedly consulting engineers do, according to FIDIC, hold their clients in a certain amount of deference. So, with respect to sustainability, FIDIC argues, in another document, that

engineers have a challenging task. They must advise clients on how trends and market drivers associated with sustainability may affect their operations, and provide them with alternatives on how to respond in ways that are appropriate to their situation. (2002b: 4)

Can it be that this commitment of the consulting engineers to their clients could jeopardise the sustainability aspect of their projects? FIDIC acknowledges that

[h]istorically engineers may have had to compromise on the delivered project since clients, in search of the most cost-efficient solution, were not as prepared as they are today to incorporate non-technical factors. (FIDIC, 2002b: 4)

These compromises happened, it appears, despite a policy document of FIDIC which recommends that engineers should make clients

aware that engineers can reduce but not always eliminate adverse environmental impacts ... [and apart from urging clients] to prevent or minimise the adverse environmental effects of projects ... even decline to be associated with a project, if the client is unwilling to support adequate efforts to evaluate the environmental issues or to mitigate environmental problems. (1990: 2)

It has already been commented that a stance such as the above could be unrealistic in the competitive world of the present. The case studies described in the previous chapter suggest that engineers continue to be under client pressures that could render their projects less than sustainable.

If the impression has been created that FIDIC has, over time, in line with trends which have previously been commented on, softened its stance on sustainability, this view can be countered by referring to many other documents that FIDIC has produced which outline far more extensively its commitment to sustainable development. In two separate documents, 15 and 67 pages in length respectively, FIDIC aligns itself strongly with *Agenda 21*, the sustainable development blueprint adopted at UNCED (FIDIC, 2002a; FIDIC, 2002b).

The [consulting engineering] industry, through FIDIC, repeatedly reaffirms its commitment to sustainable development, and has challenged its members with a pragmatic Call for Action.<sup>369</sup> The industry has also undertaken a strategic review of its business practices and operations in what was effectively an Agenda 21 process conforming to the Rio principles of sustainable development. (FIDIC, 2002a: 8)

FIDIC then goes further to outline its “knowledge-based intellectual services over the three sustainability dimensions” (2002a: 31). These are captured in Appendix M5, and again compared with the principles of the PSDF. Obviously these so-called services in the FIDIC document are very much from an engineering perspective, while again the PSDF principles cast a much wider net. Notwithstanding this distinction, it is still apparent that the PSDF principles, even in their broader approach, cover the FIDIC services adequately.

#### *10.2.2.8 Sub-Saharan African countries*

It has been mentioned previously in this study that the developing countries tend to be less outspoken about environmental issues, their immediate concerns being more about the pressing social needs that prevail in these countries. This tendency is supported by a review of the codes of conduct and suchlike documents issued by the engineering organisations of these countries. They mostly only have muted references to the environment and sustainability, if at all.

For example the code of conduct of the Engineers Council of Namibia makes no mention of the environment or of sustainable development other than that which can be construed under having “due regard to public safety and interests” (ECN, undated: 4). Such limited attention is the case too with the Engineering Professions Association of Namibia, the Botswana Institution of Engineers, the Malawi Institution of Engineers, the Institution of Engineers of Kenya, the

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<sup>369</sup> From a previous FIDIC publication, *Engineering Our Future* (1998).

Zimbabwe Institution of Engineers and the Uganda Institution of Professional Engineers. The Engineering Institution of Zambia (EIZ) is slightly more forthcoming in so far as it includes the environment in its definition of engineering. It states:

“Engineering” means the application of scientific and mathematical principles with due reference to economics, society and environment to develop solutions to technical problems, creating products, facilities and structures that improve quality of life. (EIZ, 2010: 4)

In addition the EIZ, in its code of ethics, entreats the engineer to hold “paramount the safety, health, environmental [*sic*] and welfare of the public in the performance of his professional duties” and to commit “to improving the environment so as to enhance the quality of life” (EIZ, 2010: 31, 32). The Institution of Engineers Mauritius (IEM) is even more forthcoming in that the fundamental tenets of its code of ethics requires that engineers will, *inter alia*,

hold paramount ... the protection of the environment, and shall strive to comply with the principles of sustainable development in the performance of their professional duties ... [and] shall take all reasonable steps to fully acquaint themselves and inform their clients, employers and if necessary the community, of the social and environmental consequences of the actions and projects in which they are involved ... (IEM, undated)

The Institution of Engineers Tanzania (IET) is also more elaborate in its statements about the environment and sustainability than most of the other African institutions referred to thus far. Not only does the IET, in its code of conduct, closely echo the sentiments of the IEM, quoted here above, but in addition it also insists that engineers “shall take all reasonable steps to avoid waste of natural resources, [and] damage of the environment” (IET, 2011: no page numbers). More importantly perhaps, are the values championed by the IET in its “framework for responsible professional practice” which include the following:

- Ethical behaviour
- Competent performance
- Innovative practice
- Engineering excellence
- Equality of opportunities
- Social justice
- Unity of purpose
- Sustainable development
- Accountability
- Trustfulness, honesty and trustworthiness
- Respect for human life and welfare
- Fairness
- Openness
- Protection of the environment. (IET, 2011: no page numbers)

Most of the above values correspond directly to principles contained in the PSDF, even if sustainable development itself seems to hold a more lowly position.

Moving on to the Africa Engineers Forum (AEF), a network of engineering organisations in Africa, one could perhaps be somewhat disappointed at what appears to be their lightweight commitment to sustainable development. They do indeed call for a commitment to “the best practice principles of sustainable development”, but then do not elaborate much on these, other than committing to the somewhat ambiguous concept of “sustainable engineering”. This concept is seen by the AEF as a prerequisite for sustainable development, and while it is supported by eight “principal value systems”, none of these include a direct commitment to sustainable development as understood through notions such as carrying capacity, conservation of resources, and waste minimisation. (AEF, 2004). The notion of “sustainable engineering” seems to be at best a weak imitation of sustainable development.

Considering all the African (engineering) environmental/sustainability statements reviewed here, there is nothing to suggest that the PSDF cannot adequately cover all the African aspirations in this regard, and indeed even comfortably exceed that which is mostly required.

#### *10.2.2.9 South African engineering bodies*

From the above it is apparent that the engineering organisations from a number of countries are, in one way or another, attempting to meet the modern day demands of sustainability. It now remains to investigate the position with regard to the engineering profession in South Africa, where one would hope to find, given the local profession’s links with engineering organisations in, *inter alia*, the USA, the UK and Australasia, similar levels of commitment to sustainability. However the engineering profession in South Africa has an additional burden to carry; that is the baggage from the apartheid era, a burden that all the local professions, to a larger or lesser degree, have to bear. In the words of a high-ranking government official:

Architects, engineers and quantity surveyors were involved in designing and building the black townships that reinforced the policy of separate development.

They knew, by virtue of their training, that this was not sustainable development – but they did it anyway, ignoring the fundamentals of aesthetics, protection of the natural environment or social need, because they were paid to. (Gounden, 1996)

While it is not the place here to make an historical assessment of past socio-political issues, it will suffice to make two points. Firstly, it seems that sustainability issues in South Africa have in the post-democracy era often run the risk of being politically (perhaps more specifically racially) charged. For example, not infrequently, environmental conservation practices have been accused of perpetuating colonial inequalities. Secondly, one might hope that the ready conformance of the profession in the past to the political dictates of the day, could be a lesson for the present day engineering profession, and prompt it to be more forthright in speaking out against government policies considered to be ineffective or counter productive.<sup>370</sup> By the same token the profession needs to get its own house in order. A very important step in this direction is that the profession should get to grips with the concept of sustainable development in a fundamental way, and then be prepared to follow through with appropriate actions on a more practical level. It is with regard to this step that this study could make a contribution.

It has already been mentioned that the engineering profession in South Africa is governed by the *Engineering Profession Act*,<sup>371</sup> which has sanctioned the establishment of the Engineering Council of South Africa (ECSA), the body that registers engineering professionals and prescribes a code of conduct for such professionals. The main tenets of this code of conduct have already been quoted (see §10.2.1), and it is in elaboration of these tenets that the code then proceeds to a number of ethical rules under the headings of *competency, integrity, public interest, environment, and dignity of the profession*. These concepts are common to many codes of conduct, and most of them, it can be said, have some bearing on the practice of sustainable development, but it is under the *environment* heading that the ECSA code is more explicit; it requires that registered persons (engineers) must:

- (a) have due regard for, and in their work avoid, adverse impact on the environment; and
  - (b) adhere to generally accepted principles of sustainable development.<sup>372</sup>
- (ECSA, 2006a: 4)

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<sup>370</sup> One may see the publication of the *SAICE Infrastructure Report Card for South Africa 2011* as an example of this more bold approach.

<sup>371</sup> Act no. 46 of 2000.

<sup>372</sup> The latest version of this code has replaced this provision with: “strive to ensure that in meeting present development needs, the ability of future generations to meet their needs is not compromised” (ECSA 2013: 4), an obvious throw-back to the Brundtland Report definition of sustainable development. This amendment might be considered a weakening by some, particularly if the phrase “principles of sustainable development” used in the first version of the code, had been elaborated into a full set of principles such as, for example, represented by the PSDF.

But then again, in common with many other codes of conduct, the ECSA code also fails to expand on the *principles* of sustainable development. So it is to the so-called learned organisations (or voluntary associations as they are named in the Engineering Profession Act) that one may turn to hopefully gain a better understanding of how the engineering profession in South Africa views the concept of sustainable development. The picture that emerges is one of varied hues. It appears that some South African engineering organisations have tackled the theory and practice of sustainable development with more intent than the others.

The South African Institution of Mechanical Engineering defers to the ECSA code of conduct for professionals, and in its own constitution simply requires its members to “uphold the dignity of the profession” and to “act towards ... clients and employers and others with whom ... [their] work is connected ... in a manner consistent with the established traditions of The Institution and the profession” (Rimbault, 2012). The South African Institute of Electrical Engineers and the South African Institute of Chemical Engineers are equally brief in formulating their position (SAIEE and SAIChE websites).<sup>373</sup> The Southern African Institute for Industrial Engineering (SAIIE) is also relatively brief; only two out of twelve clauses in their *Code of Professional Conduct* relate to the environment. They state, quite penetratingly one must say, that SAIIE members:

... shall have due regard for the environment and the balance of nature when carrying out ... [their] professional duties  
... shall respect life and the consequences of ... [their] professional actions shall not endanger living things. (SAIIE, undated: 30)

On the whole though these engineering organisations have very little direct reference to sustainability in their rules, and one may well deem this to be inadequate, particularly if one goes by what other engineering organisations have to said about the leadership role of engineers in the field of sustainable development.

Consulting Engineers South Africa (CESA) is a voluntary association of firms of consulting engineers, and as the recognised South African body in this field of endeavour, it is a member of the international body, FIDIC. The CESA code of conduct is thus applicable to consulting

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<sup>373</sup> See <http://www.saiee.org.za> and <http://www.saiche.co.za>. [Accessed on 12 February 2012].

engineering firms rather than to individual engineers. (Although it is a moot point, it might be suggested that individual engineers may feel less constrained by the prescriptions of CESA, than say those of ECSA, that applies directly to them as individuals.) Perusing the CESA code of conduct one finds that it too defers to the requirements of ECSA, but then further also to those of FIDIC. It nevertheless still addresses, in its own right, a number of issues typical of many other engineering codes of conduct, issues such as competence, leadership, corruption, integrity and the interest of society. However in only one clause (out of thirty-one) are the environment and sustainability directly addressed. In this clause CESA entreats its member firms to

[u]phold, and assist others to uphold the dignity, standing and reputation of the consulting industry, take all reasonable steps to protect life and to safeguard people, and seek solutions that are compatible with the principles of sustainable development and environmental responsibility. (CESA, 2011: 2)

While the above is about as brief a commitment to the environment/sustainability as one could find, it does, one must add, gain further support from another CESA document entitled *Policy Framework for Sustainable Development*. In this document CESA affirms the consulting engineering “industry’s unequivocal commitment to sustainable development”, but in respect of the details of this commitment it falls back on FIDIC and the Global Reporting Initiative (GRI) (CESA, 2010). (The GRI is an initiative that not only promotes sustainability reporting amongst commercial enterprises, but also sets standards which prescribe how this should be done.<sup>374</sup>)

Again one picks up here on the fairly common approach among many engineering organisations, in which there appears to be some commitment to sustainable development, but where this commitment does not seem to deepen into a paradigm shift; that is to say, translate into the new world-view that many environmental theorists are inclined to propound. Thus, for example, while there may be a reference to the need to adhere to the principles of sustainable development, it is then not followed through by a comprehensive exposition of these principles, at least not to the depth and extent to which one would expect that it should, if sustainable development were to be a main thrust of engineering practice. In some ways this lower level of commitment may be compared to weak sustainability, whereas as a paradigm shift

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<sup>374</sup> For more information see [www.globalreporting.org](http://www.globalreporting.org). [Accessed on 15 February 2012].

commitment is comparable to strong sustainability. This theme will be further pursued later.

The South African Institution of Civil Engineering (SAICE) is the body most directly linked to civil engineering practice in South Africa, and hence it is also of particular relevance to this study. SAICE's role in relation to the environment and sustainable development has already been touched on in Chapter 1 of this study, but it will briefly, for the sake of convenience, be reiterated here. The views of SAICE has, as one may expect, also gone through stages which reflect progressively increasing sensitivity towards the environment. An early version of the code of ethics of SAICE referred to the environment in only one clause out of nine. In this clause it is listed as one of a number of the public responsibilities of civil engineers. It requires that civil engineers should "accept a duty of care to [*inter alia*] ... the environment" and be aware of their "responsibility to protect and conserve the environment" (SAICE, undated). One could speculate that it is these minimal references to the environment that prompted the Environmental Engineering Division (EED) of SAICE to ask the following questions:

- Should SAICE include a section on environmental awareness in its Code of Ethics?
- Should we [i.e. SAICE] consider sustainable development as an issue in ethics? (EED, 1997: 3)

The most recent version of the *SAICE Code of Ethics* makes considerably more reference to the environment and sustainability, directly and indirectly. In the preamble it admits to the fact that engineering construction "rivals few in its consumption of resources and its potential to harm the Earth"(SAICE, 2005b: 1). Then in the main body of the code one finds clauses and phrases which either refer directly, or are generally considered as being linked, to the notion of sustainable development, and which demonstrate the move in SAICE thinking towards sustainability (in its broad perception) since the publication of the previous code. These include the following:

Members must protect life and the environment ...  
... manage the Earth's resources in a sustainable manner ...  
... promote socio-economic development ...  
... deliver cost effective solutions ...  
... contribute to the well-being of society ... .

Members should act with integrity and fairness ...  
... treat people with dignity and have consideration for the values and cultural sensitivities ...  
... be committed to the efficient use of resources ...

- ... minimize the generation of waste and encourage environmentally sound re-use, recycling and disposal ...
- ... seek solutions that are compatible with the principles of sustainable development ... .(SAICE, 2005b: 1-3)

While some of the more general points in the above quotation can also be found in the previous code of ethics, as a whole the above shows a much stronger commitment to sustainability. The SAICE code is reproduced in full in Appendix M7, not only because of its relevance to this study, but also so that the context and full import of the above extracts can be appraised.

While, on the one hand, SAICE seems to be in the forefront of South African professional engineering associations in terms of its promotion of sustainable development, it has not, on the other hand, committed itself to the same extent as some of its overseas counterparts. The SAICE commitment to sustainability, evident in the above quoted extracts, has not been translated into a set of more tangible guidelines, or a sustainability code of practice. Also again the reference to the principles of sustainable development are not followed up by an exposition of what these are. Given these reservations about the SAICE approach to sustainable development, which is equally, if not more applicable to the approaches of other South African engineering bodies, the question now arises as to whether it might not be possible to derive, on the basis of the discussions that have gone on here before, a sustainability guideline or code of conduct that might address the perceived shortcomings. Certainly it would be presumptuous to be prescriptive in this regard, but a prototype sustainability code of conduct, might be instrumental in getting SAICE and the other South African engineering bodies to articulate their commitment to sustainable development more concretely and extensively.

### **10.3 A SUSTAINABILITY CHARTER FOR ENGINEERS**

A number of codes of ethics or conduct, produced by engineering organisations from across the world, have been reviewed here above, and it is evident that most do address, in one way or another, and in varying degrees, the topics of the environment and sustainable development. Quite often this amounts only to a brief mention of the said topics, but in few cases there is additional elaboration in the form of attached guidelines or even a separate, more extensive code in its own right. In some cases there appeared to be a trend over time, to produce seemingly less demanding, from a sustainability

perspective, prescriptions. Often in such instances an earlier, and relatively bold statement around the topic of sustainability (often under the heading of the environment, or with bias towards the natural environment, and usually issued somewhere in the 1990s) was, over time, replaced by a more modern and briefer statement. One could gain the impression that the organisation in question had had second thoughts about the full implications of a fundamental commitment to sustainability. Perhaps, as the concept of sustainability broadened out from the initial, somewhat narrow concern around the natural environment, to an integrated network of concerns that spanned across, not only the environmental dimension, but also the social and economic dimensions, the complexity of this new, multi-dimensional characterisation of sustainability appeared increasingly daunting. Not unnaturally then, some organisations may have retreated a bit in order to give themselves more space to deal with this complexity. Be that as it may, this overview has shown that there are a few engineering organisations, the ICE being one, that have taken sustainable development, and their commitment to it, seriously. But, on the other hand, it does also seem that there is a not insignificant number of such engineering bodies that have engaged only somewhat cursorily with sustainable development.

It would thus appear quite reasonable to conclude that while engineers on the whole are supportive of the notion of sustainable development, many view it only as an add-on to their engineering activities, and only a few see it as a critical component of their practice. In order to facilitate discussion, these varied approaches by engineers to sustainable development, can be generalised and simplified into two approaches, *weak* sustainability and *strong* sustainability.<sup>375</sup> The first position is characterised by the tweaking of engineering practice here and there in an attempt to bring it more in line with sustainable development. This may be all that is deemed necessary by the practitioners, but to be more cynical, it could also be the minimum requirement that the practitioners think will mollify some of their environmental critics. In an engineering code of ethics this position could, for example, simply involve the phrase: 'engineers should adhere to the principles of sustainable development', without any further elaboration on what these principles might be.<sup>376</sup> Of course a position such as this is open to criticism. Hartley, although he is speaking of government structures, makes comments that are also relevant to

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<sup>375</sup> See also §6.2.1 and §6.3.1 for discussions around the weak and strong sustainability divide. The use of these designations here does not imply a direct correlation with the more formal understanding of these terms, but a more generalised association. In this sense one may also be reminded of Arne Naess' distinction between *deep* and *shallow* ecology.

<sup>376</sup> It might be interesting to note that in two fairly recent, and separate investigations into perceptions around instances of unethical conduct in the construction and civil engineering industries, environmental and sustainability issues were not rated at all. (Pearl, *et al.*, 2005; Abdul-Rahman, *et al.*, 2011)

engineers when he states that

a sustainability charter needs be more than a set of ‘feel-good’ statements. It should contain features and characteristics that ensure sustainability characteristics are adopted in all mainstream policies and programs by government. Sustainable development cannot be conducted on the sidelines. (Hartley, undated: 1)

The position of strong sustainability involves much more than ‘tweaking’ – many think that to adopt the position of strong sustainability implies a paradigm change. To repeat Sterling’s point,

The most pressing need is for the emergence, clarification, and adoption of a new ecological world view that can create a sustainable culture ... (1990: 77)

This position would see sustainable development as a main, if not *the* main tenet of engineering practice, and correspondingly one would expect the code of ethics to treat the concept of sustainable development far more extensively, and it may even lead to the development of ‘a sustainability charter’, to adopt Hartley’s terminology.

It would be a misconstrual to deduce from the above that engineers are either in the camp of strong sustainability or in the fold of weak sustainability. These two positions should rather be seen as the opposite ends of a spectrum, and that most engineers probable operate somewhere between these extremes.<sup>377</sup> It also means that engineers could from time to time, and from instance to instance occupy different positions on this spectrum. Part of the reason for this variability could be, as has been suggested, vagueness around the concept of sustainable development itself. It has also been mentioned previously that the engineering profession may be so inextricably bound into the traditional Western world-view<sup>378</sup> that the emergence of a new world-view within the profession – an ‘ecological’ world-view, to use Sterling’s nomenclature – will be very difficult without society itself undergoing this

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<sup>377</sup> This is not the position adopted by Bell and Morse. They argue:

There are fundamental differences between strong and weak sustainability, and they can be regarded as mutually exclusive rather than as two ends of a spectrum. Quite simply if one believes that sustainability should be strong, then no trade-off between economic gain and environmental quality is acceptable. (2008: 13-14)

If one knows exactly what sustainability is then Bell and Morse may be correct, but given the contestable nature of the concept, a spectrum of sustainability positions may be more realistic. Even if one were inclined to accept the Bell and Morse argument, surely the difference between an extensive and a limited trade-off between economic gain and environmental quality must equate to some kind of gradation in sustainability? And so a spectrum of sustainability, as it is construed here, seems quite defensible, particularly if the thrust is to adopt progressively stronger sustainability positions as knowledge, insights and motivations develop.

<sup>378</sup> The Western world-view is taken to be one that espouses growth and technology, and hence is, according to many environmental theorists, incompatible with strong sustainability.

radical change. On the other hand many of the sources reviewed here above make the point that engineers should take a leadership position with respect to sustainable development, hence implying that they cannot adopt a wait-and-see attitude. Add to this argument the view that it is the nature of sustainable development to be progressive and visionary, and one must then conclude that a sustainability code of conduct developed for engineers, should tend to be a comprehensive, cutting-edge statement rather than a brief provision added to an existing code. Obviously one can expect such a fuller statement to lean towards the strong sustainability side of the weak/strong sustainability spectrum.

A cautionary consideration may arise from the fact that a breach of an engineering code of conduct could lead to serious disciplinary action.<sup>379</sup> In this light some may feel that the codification of strong sustainability is premature. Given the ambiguity attached to the concept of sustainable development, and its evolutionary nature, so the argument would go, it is better that, at least as a starting point, the code should lean more towards weak sustainability, and that over time, as the implications became clearer, it could transform itself into an expression of strong sustainability. This could well be the reasoning, be it intuitive or not, behind the lowered prescriptiveness that was discerned in the more modern sustainability codes. But then, to return to a point already made, is it not exactly the vagueness inherent in the concept of sustainable development that mandates a more extensive code of conduct, even if then of a softened prescriptive nature?

While a number of the codes reviewed here above include sustainability as a subsidiary component of the general code of ethics (a situation which may contribute to the perception that sustainability is an 'add-on'), this study takes a different approach. If environmental (broadly defined) problems are ubiquitous, if holism is claimed as a primary characteristic of sustainability, and if beneficence, the most basic of all ethical values, is central to sustainability, then sustainability can be no other than a fundamental aspiration of society. And if this is the case, one must argue, by extension, that sustainability can be no other than a principal canon of engineering. Hence, the conclusion reached in this study is that a sustainability code of conduct for engineers is not only necessary, but it is also fundamental. Brief 'add-on' sustainability statements to an existing code of conduct can simply not

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<sup>379</sup> For example the SAICE Constitution states:

The Executive Board may take disciplinary action against a member ... including the expulsion of such member ... from the Institution ... who ... is found to ... be in material breach of the Code of Ethics of the Institution. (SAICE, 2005a: 4)

convey the depth and range of the concept.

Having suggested that sustainability should be fundamental to society, does not mean that it is. And so if society itself is still operating, at best, within the paradigm of weak sustainability, can engineers, who essentially are in the service of society, adopt a strong sustainability approach? If they are to attempt to do so it seems that they would need a strong supportive professional environment in which the sustainability ethic is embedded. One practical way in which such an environment can find expression is in the form of an explicit sustainability code. A question which may then arise is the following: should a sustainability code for engineers be a policing or advocacy mechanism? It has already been argued that sustainability should be no other than a principal canon of engineering. However, given the position of society in general, and the South African society in particular, with its history of discrimination and oppression, and its current urgent developmental needs, plus the already mentioned equivocal nature of the sustainability concept itself, then it might simply be pragmatic to avoid a dogmatic and authoritarian code. In other words, the suggestion here is that the advancement of sustainable development amongst South African engineers would be better served by not following the route of a legalistic code, that attempts to have the final say in matters of sustainability, and instead to have a more broadly based, explanatory and evolving code. But this does certainly not mean that the full meaning and depth of sustainability can be conveyed in a simple, unembellished 'add-on' statement in a code. Instead it seems that sustainability merits a code in its own right, and that it should aim to inform and guide, not unlike a manual. Given the foundational status (ideally) accorded to sustainability, it must certainly address fundamental issues; it must also be aspirational and visionary. What is being suggested here thus seems less like a code, but something more full bodied, maybe something more like a *charter*. Synonyms for the word *charter* include contract, compact and agreement, and also code, rules and law.<sup>380</sup> Out of this range of interpretations, the interpretation that is favoured here is one that would see a charter as a contract or agreement that engineers could symbolically enter into, and if it has the flavour of a code or rules it is more so in the spirit of guidance rather than that of mandatory prescription. This does not imply that the charter will be wishy-washy and optional; rather its moral authority should be unquestioned, and its guidance, while not dogmatically prescriptive, will only be tolerant of deviance on well justified grounds. And so, in this

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<sup>380</sup> *Reader's Digest Oxford Complete Wordfinder*, 1993. London: Reader's Digest Association Limited.

light, what will be proposed in this study is a *sustainability charter for engineers*.<sup>381</sup>

In this study it has been found that the vagueness on the one hand, and the complexity on the other hand, of the concept of sustainable development cannot be captured in a one- or two-sentence definition, but rather that a sustainability framework of *inter alia* vision, values and principles could be more effective in describing the width and depth of the concept. To this end a Framework for Sustainable Development (the PSDF) has been proposed. (See Appendix F.) As it stands to reason that the suggested sustainability charter for engineers will have to be based on an in-depth and comprehensive understanding of sustainable development, it is suggested here, based on the justification to be given below, that the PSDF can fulfil that role adequately.

It may be remembered that Engineers Australia produced their own *Sustainability Charter* (EA, 2007), and it is now deemed appropriate to re-visit it. The Australian document appears to have been developed in order to motivate for a “national sustainability charter” to be drawn up at governmental level (Hartley, undated: 3, 6). It thus seems that engineers are not its main target audience, and its generalist nature supports this contention. Its relative brevity – it has only three ‘aspirational objectives’, followed by eight (what could be called) guidelines – might compromise its efficacy as a broadly focussed guidance document. By comparison the PSDF, as developed in this study, has three foundational principles from which flow 18 subsidiary principles, arranged dimensionally. The principles are followed by themes and applications, and all of these in conjunction with its guiding vision and values make of the PSDF an altogether more comprehensive and structured statement. It is thus contended here that the PSDF, in terms of its scope and multi-sourced background, is uniquely suited to be the basis of the sustainability charter that is being proposed here. In addition it may be reaffirmed that the comparisons drawn between the PSDF and the various codes of conduct that have been reviewed here above, have not found the PSDF wanting in terms of sustainability requirements. Being sourced from many general sets of principles the PSDF has, like the EA *Sustainability Charter*, a generalist nature. So, if anything, it may lack in some engineering perspective. To compensate, the charter to be proposed here will, in its introductory paragraphs, draw focus specifically to the role of engineers in sustainable development. This will be done using some insights gained from the reviewed engineering codes of conduct. But in the final instance, there thus appears to be no principal reason why

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<sup>381</sup> While this charter is being proposed in the context of the civil engineering profession in South Africa, the question of whether its scope is limited to this context is, for the moment, still open.

the PSDF cannot adequately undergird the sustainability charter being proposed here.

An abbreviated version the proposed Sustainability Charter for Engineers is set out here below, while the full version is produced in Appendix N.

**SUSTAINABILITY CHARTER FOR ENGINEERS**

**PREAMBLE**

The world is facing widespread environmental and social problems, which can only be addressed holistically through the process of sustainable development. Thus it is necessary for sustainable development to become the primary instrument of policy. The objective of sustainable development is to transform society so that it lives in harmony with the environment while meeting the needs of both present and future generations.

**ENGINEERS AND SUSTAINABLE DEVELOPMENT**

Engineering projects, broadly understood, are unrivalled in terms of their impact on society and the environment.

- Hence it is of critical importance that engineers adopt sustainable development as a fundamental tenet of their practice.
- Because of their position as technical agents engineers will often be cast in leadership roles with respect to sustainable development. Hence
  - they need to be aware of their own individual and their profession’s limitations in addressing sustainability issues
  - they need to recognise the multi-disciplinary nature of sustainability solutions
  - they need to advocate sustainability to government, society, clients and colleagues, and be firm in their rejection of non-sustainable approaches
- It would be inappropriate for engineers to compete for commissions on the basis of lowered commitments to sustainable development. If clients cannot accept these commitments their commissions may have to be declined.
- In order to fulfil their role in all of the above engineers have to adopt the vision, the values and the principles of the sustainable development framework given here below as fundamental to their practice. It follows that engineers have to exhibit honesty and integrity in all their dealings with their clients, the authorities, fellow engineers and members of the public.

**SUSTAINABLE DEVELOPMENT FRAMEWORK**  
(See Appendix F)

FIGURE 10.4: PROPOSED SUSTAINABILITY CHARTER FOR ENGINEERS

It may be remembered that the initial target group of the now freshly formulated charter was the civil

engineering profession in South Africa. However a perusal of the proposed charter shows that its articulation does not limit it to one particular discipline of engineering, nor, for that matter, to any given national jurisdiction. Hence the general nature of its appellation. However, given the spirit in which this charter has been proposed, the addition of disciplinary or national priorities is not precluded, provided of course that there is no contradiction in their formulation compared to the rest of the charter. It also needs to be noted that the charter as here proposed, is the culmination of much of the preceding discussions, and that these could, in very brief summary form, be presented with the charter, as the context in which it is being proposed.

Having a sustainability charter for engineers does not imply that engineering practice automatically becomes sustainability engineering practice. Certainly it depends to some extent on the prescriptive powers assigned to the charter, but more importantly it depends, to use modern jargon, on 'buy-in' from practising engineers. This will, in turn, depend to a large extent on their education and training. Obviously then the question is to what extent engineering educational programmes do, and should present sustainability as a basic tenet of engineering. And that will be the topic for the next chapter.

## CHAPTER 11

# HOW CAN THE CIVIL ENGINEERING PROFESSION IN SOUTH AFRICA RESPOND TO THE CHALLENGES OF SUSTAINABLE DEVELOPMENT? – PART 2

... we came to believe that adding environmental courses to existing engineering curricula would not be enough. A deeper level of change was needed. Indeed, what we seemed to be looking for was a rather different sort of engineer, one who would be broader-based and with skills significantly different from those of most conventional engineers. (Elms, 1995a: 1)

### 11.1 INTRODUCTION

It is a moot point whether engineers who have been educated in a certain paradigm can, through the prescriptions of a new code of conduct, be converted to a new paradigm. In simple terms, what is being implied here, is that if sustainability is to become a main tenet of engineering practice, it will also have to be that in engineering education. In traditional engineering education programmes engineers are schooled to meet, by and large, the demands of the market economic system, and these could be substantially different from the demands of a sustainability driven system, which, according to Sterling, requires an “ecological” world-view. It seems logical that for such a fundamentally different world-view to be inculcated in engineers, it will have to be rooted right back into their basic engineering education programmes. It would not be adequate to simply add on one or more environmental/sustainable development type offerings to existing engineering programmes. If the objective is to make sustainability foundational to the attitude of engineers, then it will have to be a principal thrust of their education. Elms sees this requirement as follows:

More specialised and specific courses can give particular skills as well as the body of knowledge that education must impart, but skills and knowledge are not enough. Even more important is the framework within which they are used, which is very much governed by the attitude, by the world view, the *weltanschauung*, of the student. And so, where environmental engineering and environmental awareness are introduced by adding new courses at a later stage to what is basically an older and unchanged curriculum framework, the results will be new knowledge, but unchanged attitudes. (1995a: 2)

This is not to say that courses added on to the usual engineering curriculums, or continuing professional development short courses, are not useful, or are not needed. Rather it appears that at present there

might be a need for two types of engineer. All engineers, irrespective of their discipline need to understand the basics of sustainable development, but then there will also be a need for engineers who could be called sustainable development specialists. Engineers of the first type will be the target for add-on type courses, and they will be engineers being trained in one or other of the usual engineering disciplines such as civil and mechanical engineering. They could also be practising engineers who need to upgrade their knowledge and skills with respect to sustainability through the medium of continuing education. The second type of engineer would receive an in-depth education in the new paradigm, that is to say, in an engineering education of which sustainable development is a main plank. Elms refers to both of the above types of engineers as “environmentally educated engineer[s]”, but the second type of engineer he refers to as an “environmentally involved engineer” (1995a: 3).<sup>382</sup> The designation “environmental engineer” has been in use for some time, but it has, particularly in the USA, quite a narrow connotation, in that it refers to engineers operating in the arena of waste disposal and pollution control. These engineers, previously also known as sanitary or public health engineers, have no more knowledge of sustainable development, than say civil engineers in general, and they may possibly not even be “environmentally educated”, in Elms’ sense. To use Elms’ nomenclature then, one can say that all modern day engineers should be “environmentally educated”, but that some, instead of following a traditional engineering discipline, would pursue the option of becoming “environmentally involved engineers”, by following special engineering education programmes dedicated to sustainable development. In this context the term ‘environment’ should obviously be broadly interpreted beyond just simply the natural environment. To avoid any ambiguity (particularly in relation to the narrow interpretation assigned in the US to ‘environmental engineers’), it is felt here that the term ‘environment’ should rather be replaced by ‘sustainability’. Of course the designation ‘sustainable engineering’ is already being used quite freely, but the unsuitability of this expression has been discussed, and moreover, its derivative, ‘sustainable engineers’, simply sounds somewhat fatuous. It would be more appropriate if engineers of the second type (those whom Elms calls “environmentally involved engineers”), were to be called ‘sustainable development engineers’, and their practice ‘sustainable development engineering’. But these designations, their appropriateness notwithstanding, remain somewhat unwieldy, and so it is here suggested that they be replaced by the more succinct labels of, *sustainability engineers* and *sustainability engineering*.

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<sup>382</sup> It must be borne in mind that at the time of Elms’ writing it was still customary to use, for example, the phrase ‘environmental matters’ for what in the present times might quite commonly be dubbed as ‘sustainability matters’.

In the sub-sections which are to follow, most of the attention will be focussed on the education of these, as they are here named, sustainability engineers, rather than on the more general 'environmentally educated' engineers.

## **11.2 THE NEED FOR SUSTAINABILITY ENGINEERS**

In general it is the widely perceived environmental problems, and the possible contribution of engineering practice to these problems, that suggest that traditional engineering is not quite meeting the modern day challenges. The case studies discussed in Chapter 9 are indicative of these types of challenges and their engineering links. Furthermore, ongoing and worsening problems such as deforestation, desertification, climate change, etc., suggest that the challenges facing society in general, and engineers in particular, are not decreasing or getting any easier. The intractability of these issues resides not only in their technical complexity, but also in the range and extent of their effects. Technical problems and social issues have become more overtly intertwined. While engineers have traditionally considered social problems to be beyond their ken, in the modern context they find themselves increasingly drawn into such issues. And where they try to avoid these issues, their professionalism comes under attack, their technical expertise notwithstanding. For example, the alleged complicity of the engineering profession in apartheid era defaults could, at least partially, be said to arise in the engineers' neglect to consider the social component of their technical briefs. Also it can be said that many engineers experience unease when faced with the open-endedness and imprecision characteristic of social issues, given the neatness and singularity of the technical solutions to which they are accustomed. It may thus be argued that traditional engineering education has not prepared engineers very well to deal with the extended type of 'environmental' problems. In order to investigate how engineering education should deal with these modern challenges, it may be constructive to firstly explore the nature of these 'new' types of problems, and then secondly to determine in what respects engineers are ill-equipped to deal with them.

The most obvious characteristic that adheres to these 'new' problems is their complexity (Elms, 1995b: 16-17). It is a complexity that arises from several sources. Firstly it is the extended relationships that characterise these problems. The simple, often linear relationships that engineers are used to, are now replaced by non-linear, multivariate relationships that defy exact definition let alone solution. Thus it

is not only technical complexity that is evident in these problems, but also conceptual complexity.

Cilliers characterises this distinction as that between complicated systems and complex systems:

Some systems have a very large number of components and perform sophisticated tasks, but in a way that can be analysed (in the full sense of the word) accurately. Such a system is complicated. Other systems are constituted by such intricate sets of non-linear relationships and feedback loops that only certain aspects of them can be analysed at a time. Moreover, these analyses would always cause distortions. Systems of this kind are complex. (1998: 3)

Cilliers went further and listed ten characteristics of complexity, which Swilling and Annecke condensed into seven:

- Complex systems comprise a large number of diverse elements that in themselves can be simple. ... The whole is, therefore, more than the sum of its parts.
- The interactions between the elements are non-linear. This means ... [that when] some of the elements interact with others, the effects ... cannot be predicted with certainty ... .
- There are many direct and indirect feedback loops operating simultaneously all the time. This makes it impossible to identify a simple linear cause-and-effect relationship. ...
- Complex systems are open systems. This means they continuously exchange energy or information with other systems located in the external environment. ...
- Complex systems have a memory which is held by the system as a whole. ... [This] makes it possible for complex systems to have a history, which, ... is a critical determinant of the system's future behaviour.
- The nature and behaviour of the system is determined by the quality of the interactions between the elements, and not by the properties of any one or more of the elements. ... [Thus] the behaviour of the system cannot be predicted by reference to the nature of any of its elements.
- Complex systems are inherently adaptive. They can organise and reorganise their internal structures and operations without the intervention of an external agent. (2012: 12-13)

It will not be correct to assume that engineers never deal with any of the above characteristics; in fact the Engineering Council of South Africa (ECSA) requires that engineers need to be able to handle *complex engineering problems* which it defines as follows:

***Complex Engineering Problems*** have the following characteristics:

- (a) require in-depth fundamental and specialized engineering knowledge;
- and one or more of:
- (b) are ill-posed, under- or overspecified, requiring identification and refinement;
- (c) are high-level problems including component parts or sub-problems;
- (d) are unfamiliar or involve infrequently encountered issues;
- and one or more of:

- (e) solutions are not obvious, require originality or analysis based on fundamentals;
  - (f) are outside the scope of standards and codes;
  - (g) require information from a variety of sources that is complex, abstract or incomplete;
  - (h) involves wide-ranging or conflicting issues: technical, engineering and interested or affected parties;
- and one or both of:*
- (i) requires judgement in decision making in uncertain contexts;
  - (j) have significant consequences in a range of contexts. (ECSA, 2011: 1-2)

So, it seems that complex engineering problems, as envisaged here above, do not of necessity exhibit all of Cilliers's characteristics simultaneously. Furthermore engineers often introduce simplifications in an attempt to eliminate uncertainties, and to approximate linear, or at least predictable, systems. There is no doubt that this latter approach works extremely well in many engineering applications. If the difference between complicated systems and complex systems (described above) is conceptualised as a spectrum rather than a duality, one could say that engineering systems may often occupy a position somewhere between the extremes of the spectrum. But, as Swilling and Annecke attempt to show in the first chapter of a book that they authored, sustainability has, of necessity, to deal with complex systems (2012: 3-25), and therefore would find itself more confined to the complex side of the posited spectrum. One may therefore conclude that the same would apply to sustainability engineering, and that this would distinguish it from engineering in general. In other words, by embracing complexity in Celliers's sense, engineering will be more able to engage the new "ecological" paradigm, and thus be transformed into sustainability engineering.

Thus, taking complexity as being inherent to sustainability engineering, traditionally educated engineers may, by virtue of their singular training, reveal some weaknesses in this regard. Elms (1995: 20) lists the following:

- Conceptual analysis.

The ill-defined, abstract nature of the 'new' problems does not fit comfortably into the numeric/spatial frame of reference at which engineers excel. The problems are characterised by uncertainty and ambiguity. In short engineers are not necessarily adept at dealing with complex problems as complexity.

- Communication

Engineers, with notable exceptions, are in general notoriously poor communicators. While

courses in communication skills have become fairly common components of engineering programmes, they mostly still occupy fringe positions. Complexity and public involvement, key aspects of sustainability engineering, demand high levels of communications skills.

– Relating to other disciplines

Not unrelated to the problem of communication is that of dealing constructively with other disciplines. The wide scope of the problems to be dealt with in sustainable development make multi-disciplinary approaches inevitable, a situation in which single discipline specialists might feel somewhat inhibited. Furthermore technocentrists, such as engineers may be, value techno/numeric 'hard skills' highly, and in consequence tend to be somewhat dismissive of some of the other, so-called 'soft skills', that social scientists usually bring to multi-disciplinary approaches. In short, engineers will have to see multi-disciplinary approaches as a strength, rather than as a hindrance. Even with society in general will engineers need to appreciate the value of two-way interaction. Adamowski states quite frankly that

sustainable development will require a move away from a traditionally isolated engineering design process to one that is not only open but which incorporates a broad set of people into the decision making process. (2012: 180)

– Understanding limitations and underlying assumptions

While engineers may be specific about the technical assumptions of their work, the deeper methodological and philosophical assumptions often go unnoticed. For example, engineers might often simply assume their science and practice to be value-free, thus not recognising or being unaware of the underlying values that inevitably influence their work.

– Leading complex projects

In this study reference has, several times already, been made to the leadership role that engineers see for themselves in sustainable development. While the extent and scope of the engineering component of complex projects suggest that it would be ideal for engineers to be in the leadership position, the fact is that they probably are, by virtue of the shortcomings already listed, not automatically suited to this role.

It appears thus that the nature of 'modern' environmental problems is such that it poses new, demanding challenges for engineering practice; challenges which traditionally educated engineers are

not well equipped to deal with. In short, what is being suggested here, is that the problems of sustainable development are so complex and intractable that their resolution demands special skills; skills, it is argued here, that will only come to engineers if their training and education has sustainability as its main thrust. Elsewhere it has been stated that:

We live in an increasingly complex world and we are at a critical juncture at which humanity must make some serious choices about the future. ... It is undeniable that the world and its cultures need a *different kind of engineer* [emphasis added], one who has a long-term, systemic approach to decision-making, one who is guided by ethics, justice, equality and solidarity, and has a holistic understanding that goes beyond his or her own field of specialisation. (EESD, 2004: 1)

Hence the focus now shifts to a consideration of the main characteristics of sustainability engineering education.

## 11.3 ENGINEERING EDUCATION AND SUSTAINABLE DEVELOPMENT

### 11.3.1 Foundational issues

While it is the nature of the modern day challenges mentioned here above, together with the perceived shortcomings in the traditional engineer's armoury, which obviously must dictate, to a large degree, the characteristics of sustainability engineering education, Thom saw the first step as follows:

A first step in redirecting the education of engineering will require the adoption of sustainability ethics within the profession. Sustainability calls for fundamental changes in personal and professional conduct. (1995: 27)

In Thom's view then, the first step is the acceptance of "sustainability ethics *within* the profession" [emphasis added]. The question then is how this can be done. While it seems obvious that there must be more than a modicum of sustainability short courses under the umbrella of continuous professional development, and also the adding on of sustainability courses to traditional engineering curriculums, they, in themselves would not be able to guarantee the general adoption of the sought-after sustainability ethic. It is argued here that the formal ratification, within the organised profession, of a sustainability charter, such as has been suggested in the previous chapter, would add significant impetus to Thom's first step. But, in the final instance, one may have to admit that an ethos of sustainability will only be more

generally evident in the engineering profession when a coterie of engineers, who have passed through a full sustainability engineering educational programme, enter the ranks of the practising engineers.

If one ponders a little further what is meant by an ‘ethos of sustainability’, it seems to go without saying that the abovementioned sustainability charter and the sustainability engineering educational programmes will have to be literal and explicit embodiments of this ethos. This means then that the said sustainability charter should incorporate, one would think, an explicit articulation of the ‘sustainability ethic’. The sustainability charter, as it has been proposed in the previous chapter, incorporates the PSDF (see Appendix F), which does make explicit its vision, values and foundational principles. In short then, what is being proposed here, is that the sought for sustainability ethic is that which is encapsulated by the vision, values and foundational principles of the PSDF. By extension it then follows that the PSDF, with particular reference to its foundational elements, must also undergird the sustainability education of engineers. It could be argued that the vision of the PSDF, that of striving towards a sustainable society, is so eminently plausible that one could hardly not believe that engineers in general would endorse it. In similar manner the values of the PSDF, emanating as they do from our evolutionary and cultural history, and having been identified on the basis of their perceived universality, could claim equally widespread acceptance amongst engineers. And so it may be concluded that the sustainability engineering education being pursued in this chapter will have at its heart, the vision, values and foundational principles of the PSDF, and that it will be the objective of this education to ensure that the PSDF vision, values, etc., are so purposefully inculcated in student engineers that they become the sustainability ethic of engineering practice.

Of the foundational principles of the PSDF it is the principle of holism that is probably the least widely accepted and hence calls for some justification here.<sup>383</sup> Some effort has been expended here above in explaining the notion of complexity and its close association with sustainability. Given the emphasis on multiple relationships in complexity theory, it follows that to a large extent it is holistic considerations that make complexity complex. The implication that holism is an integral part of sustainability can thus not be avoided. Another way of putting this is that

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<sup>383</sup> A full motivation of the holism principle was given earlier (see §7.1.1), but it is re-visited here in the context of sustainability engineering.

environmental (broadly speaking) systems are best understood through systems theory and holism is part and parcel of systems theory. As such the principle of holism also has significant implications for sustainability engineering education and practice. Some of these implications will be discussed in the sub-sections to follow, but as an example one may consider the issue of specialisation. It is a characteristic of traditional engineering courses (and indeed also of a host of other courses across the higher education spectrum), that they find expression in a reductionistic frame of reference. The entire field of study is broken down into many smaller components, which are, each in their own right, studied intensively in order to improve understanding. Thus it may be said that specialisation is characteristic of higher education, particularly at masters and doctorate level. In Elms' view

there are good reasons for specialisation. Specialists can be remarkably effective, and efficiency increases. Nevertheless, intense specialisation is vulnerable to change [a characteristic of complex systems], and where it concerns people, there are moral and ethical issues to be considered as well. (1995b, 21)

Considering the almost impossibly broad field of sustainable development, and the fact that the human mind, while amazing in terms of its capabilities, does have limitations, the reductionistic approach, and hence specialisation, is inevitable. While it is simply practical to specialise, it can be carried though to such an extent that a holistic view becomes compromised. Given the value accorded to specialisation in academic circles, it leaves little space and recognition for more generalist approaches. Elms compromises by suggesting an approach based on “a *generalist* methodology”, which in turn derives from the “need to *specialise* in generality and complexity” (1995a: 4).

Obviously then the balance between specialisation and generalisation needs to be finely tuned, but in the final instance, it is the broader perspective that is paramount, by virtue of the holistic principle. A study that investigated, on the basis of a widespread survey, the need for, and the structure of, environmental (read sustainability) education for members of the planning professions<sup>384</sup> concluded as follows:

This inter-relatedness of things, which derives from the principle of **holism**, gives meaning in its own right. ... It is, inescapably, the core element of

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<sup>384</sup> The planning professions included, *inter alia*, architects, building managers, civil engineers, electrical engineers, mechanical engineers, landscape architects, land surveyors and quantity surveyors.

environmental education for the planning professions. (Long, 1994: 6.5)

As it has been argued in this study that holism is of foundational importance to sustainable development, it cannot be less so for sustainability engineering, and obviously then too for sustainability engineering education. This being the case, one can expect that its impact will filter through at various levels of the academic structure, content and presentation of an educational programme in sustainability engineering. This will be evident in the discussions which are to follow.

### **11.3.2 Academic issues**

The proposal being developed in this chapter can, at this stage, be summed up as follows: the PSDF is an appropriate framework around which the sustainability education of engineers (in SA) can be structured. Given its hierarchical structure of vision, values, principles, measurement themes and methodologies, it is eminently suited in providing the ethical foundation of, and curriculum pointers for a proposed educational programme in sustainability engineering, suitable (but not necessarily exclusively so) to the South African situation.

While the finer detail of the curriculum of such an educational programme in sustainability engineering is beyond the envisaged scope of this study, the discussion of some general pointers in this regard remains appropriate. Firstly, it may be instructive to show how the PSDF can be used to direct the curriculum. Taking the carrying capacity principle from the PSDF as an example, one can see that topics such as ecological resilience, resource use, resource substitution, consumption patterns, etc. not only flow from it, but that they in turn can be linked back again to other principles within the social, economic and institutional dimensions. Other topics which flow quite directly from the PSDF include, environmental ethics, environmental law, environmental assessments, development theory, ecological economics, etc.<sup>385</sup> It is confidently suggested here that the PSDF, bearing in mind its wide spread over the environmental, social, economic and institutional dimensions, provides ample scope for the development of the curriculum of an educational programme for sustainability engineering. It stands to reason that an educational programme so founded and structured will expose students

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<sup>385</sup> In most cases the descriptor, 'environmental' can fruitfully be interpreted as 'sustainability'.

from the start of, and throughout their studies to the notion of sustainability, and hence not only provide them with the requisite knowledge and skills for sustainability practice, but hopefully also inculcate in them the attitudinal orientation that Elms calls for.

It follows directly from the holism principle in the PSDF, and the wide scope of the PSDF itself, that *multi-disciplinary* approaches will be an essential component of the sustainability education for engineers. But if multi-disciplinarity simply “brings together several disciplinary focuses” (Ashford, 2004: 244), which only means that a range of loose-standing topics from various disciplines will be included in the curriculum, it will fail to reach the full depth of the principle of holism. While such a simplistic multi-disciplinary approach must have some advantage in exposing students (and practitioners) to views from different disciplines, it is an integrative approach, applied “across disciplines” that is more holistic in essence. Ashford calls this latter approach *trans-disciplinary*.

Where broad system changes are desirable, trans-disciplinary approaches are essential. Trans-disciplinary approaches really “open up the problem space of the engineer”. By their nature, trans-disciplinary approaches synthesize and integrate concepts whose origins are found in different disciplines, and system innovation requires synthesis. (Ashford, 2004: 244-245)

Ashford also identifies an *inter-disciplinary* approach which occurs “literally ‘between disciplines’ – [and] often precedes the creation of a new well defined field” (2004: 244). As an example he uses the coming together of chemistry and biology to produce biochemistry, a new subject in its own right which is not “necessarily broader or narrower than the parent disciplines that spawned it” (Ashford, 2004: 244). Thus, against the background of the holism principle, and using the disciplinary categories of Ashford, one could argue that inter-disciplinary, multi-disciplinary and trans-disciplinary approaches, in that order, produce increasing levels of holism and hence sustainability. Accordingly it may be said that while inter-disciplinary sciences may be necessary for sustainability (e.g. as is the case with biochemistry), they do not address sustainability *per se*. Multi-disciplinary sciences are better in this regard, but they still lack the integrative drive of the trans-disciplinary sciences, they can only be taken to represent weak sustainability. It is only the trans-disciplinary sciences then, which, because of their integration across disciplines, are capable of representing strong

sustainability.<sup>386</sup>

These ideas can be further expanded with the aid of a graphical depiction of the different ways in which we can model our experiential world. Two of such ways, the first a model of our perceptual world, and the second a model of our conceptual world, are depicted in Figure 11.1. The first model portrays the real world as we experience it mainly through our senses. Based on our sensory input we create a mental impression of the real world. This impression consists of mental and linguistic constructs, that represent, for example, the animals, the plants, the people, the cultures, etc. that we have perceived, and that we use to describe the real world. Collectively these constructs make up the conceptual world.

The elements of the perceptual world are grouped together in either one of two perceived categories, these being the natural environment and the social environment. It is important to note that society does not exist independently of the natural environment; it is in fact contained within and is part of the natural environment. The traditional dualistic world-view that sees human beings as phenomenologically different to and separate from nature, is challenged by this nesting of the social environment within the natural environment. Not a few theorists argue that many of our environmental problems are in fact rooted in the flawed perception that sees humans as separate from nature.

When we stand back from the world as we perceive it, in order to understand and discuss it, and to study it scientifically, we create our conceptual world. Our conceptual world consists of ideas and theories that are used to describe our perceived world, and particularly the relationships that we observe in that world. The natural and social environments in the perceived world are represented, respectively, by the natural and social sciences in the conceptual world. These two science categories are in turn sub-divided into such well-known disciplines as zoology, botany, etc. in the natural science category; and sociology, philosophy, etc. in the social science category. In this conceptual world the mathematical sciences are not specifically tied back to any component of the perceptual world, but they are simply seen as tools which are used to facilitate understanding in the other sciences.

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<sup>386</sup> It may be noted that these various grades of disciplinary association represent necessary but not sufficient conditions for the respective levels of sustainability to which they are coupled.

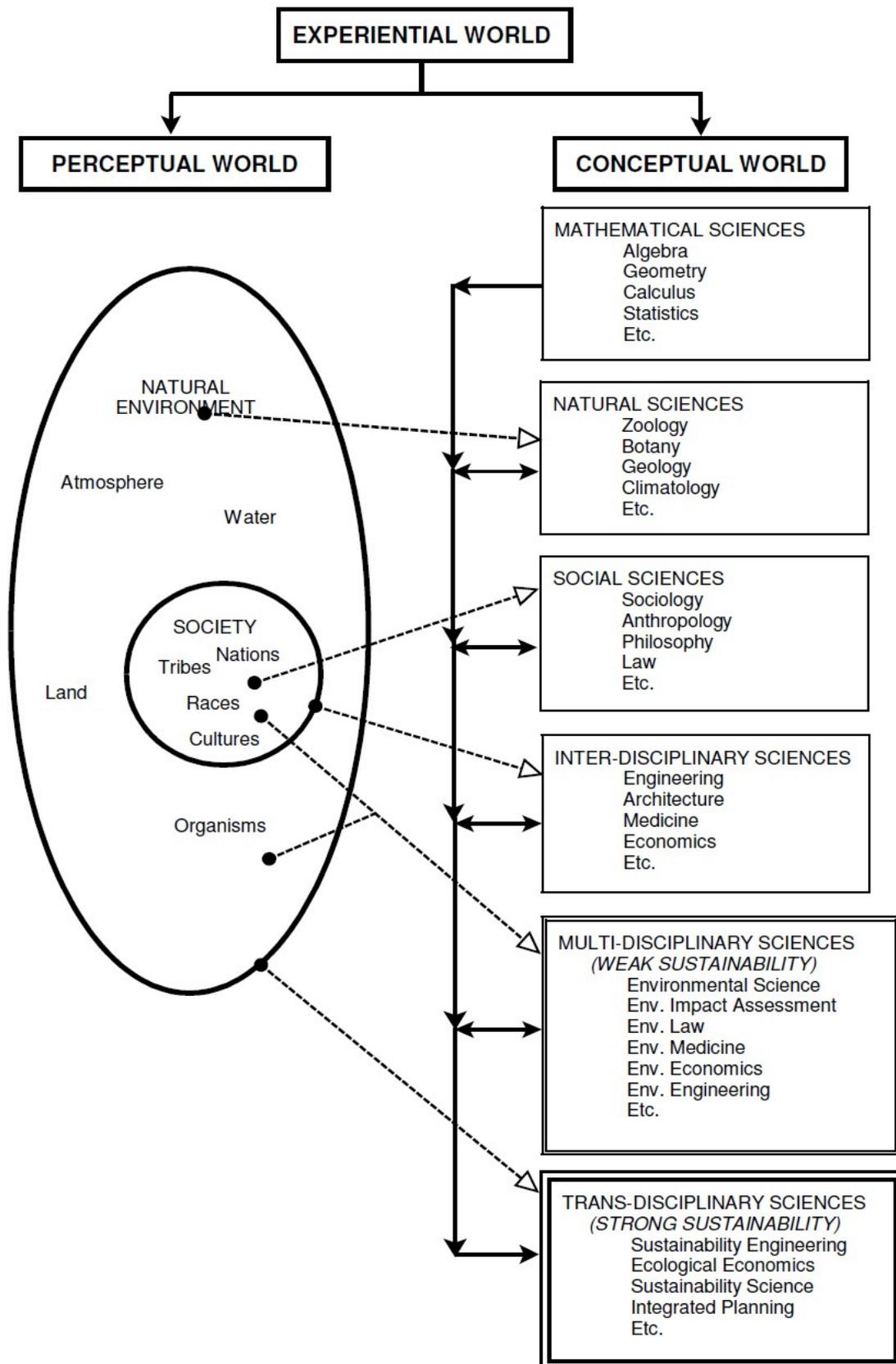


FIGURE 11.1: MODELLING OUR EXPERIENTIAL WORLD TO SHED MORE LIGHT ON SUSTAINABILITY

While the entities within the natural and social environments can be studied in isolation, it is very apparent from our daily living that there are real connections between these environments. For example, in order to live we need water; nature provides water, but to match this human need with the water resources that are available in nature, we employ the “inter-disciplinary science” of water engineering. More such matches of human needs and natural resources, such as for example in the areas of sanitation and human habitation, when all taken together make up the established field of civil engineering. Of course civil engineering has become so well entrenched as a discipline in its own right, that its ‘inter-disciplinary’ roots have faded into the background.<sup>387</sup> The inter-disciplinary sciences in Figure 11.1 spring from the contact between society and the environment and they are depicted as arising at the society/environment interface. They are driven essentially by societal needs,<sup>388</sup> and environmental concerns as such are not an issue. This anthropocentric bias is often the cause of serious environmental problems (such as anthropogenic global warming, for example), and hence one cannot say that the inter-disciplinary sciences, as a rule, produce tangible sustainability results.

In recent years, as environmental concerns grew, many disciplines were adapted so as to take these concerns on board. For example, the discipline of engineering in taking specific account of the impact of engineering activities on the natural environment, is transformed into the more multi-disciplinary field of environmental engineering.<sup>389</sup> The multi-disciplinary sciences are nominally concerned with both the social and the natural environments, but usually one of the dimensions may dominate, and full integration of the dimensions is absent. In environmental law, for example, the emphasis is on the natural environment, while in environmental medicine the focus is, in the main, on human health. Even in some cases where the attention seems to be focussed primarily on environmental issues, human imperatives are still in the background. In environmental economics, for example, while natural resources are to be husbanded wisely,

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<sup>387</sup> It should be noted that inter-, multi-, and trans-disciplinary sciences as they are referred to in Figure 11.1 involve some form of combination of natural and social sciences. This need not necessarily always be the case, but if it isn't then it is not of relevance here.

<sup>388</sup> These are natural resource needs, or otherwise instances where the natural environment is adapted and modified to make human life more amenable.

<sup>389</sup> As has been mentioned previously the term ‘environmental engineering’, as it is being employed here, goes significantly beyond the older, more narrow interpretations, such as for example in the USA where it used to refer to sanitary or public health engineering.

they are still viewed instrumentally, and economic growth is still a primary development objective, which, it is argued, makes *inter alia*, environmental protection possible. Consider also environmental impact assessments, which while involving multi-disciplinary assessments, are still tentative in terms of integrating these assessments into an aggregate assessment of sustainability. Moreover in many instances EIAs culminate, the environmental issues notwithstanding, in a political decision, in which human needs feature prominently. Because of this persistent anthropocentric bias,<sup>390</sup> the multi-disciplinary sciences, as conceived here, are considered to be only weakly sustainable. One can make a loose comparison here with the deep and shallow ecology categories of Arne Naess (1998: 441-443), by characterising these multi-disciplinary sciences as being representative of ‘shallow’ sustainability. This light-weight understanding of sustainable development, probably quite typical of many politicians, businessmen and engineers who see themselves as enlightened and progressive, is not being totally discounted here, as weak sustainability is better than no sustainability at all. It should furthermore be remembered that society itself, at institutional level, seldom operates beyond the level of weak sustainability. It may also be that the sustainability demands in a particular situation are not clear, or fully understood. The full integration demanded by ‘deep’ sustainability is complex, and its ramifications so far-reaching that, in many instances, strong sustainability can only beckon as an ideal.<sup>391</sup>

Returning to the conceptual world as modelled in Figure 11.1, it can be seen that in terms of sustainability, the hierarchy of sciences culminates in the trans-disciplinary sciences, which build on all the other levels of sciences. An in-depth interpretation of sustainable development, which attempts to do full justice to the notion of holism, must according to Hedrén and Linnér, “encompass ... the *whole* range of academic disciplines” (2009:199; [emphasis added]). As has been said, the trans-disciplinary sciences aim to be truly integrative. They also reflect the understanding that society is nested within the natural environment, and that it is environmental issues that ultimately determine sustainability. Hence in Figure 11.1, the trans-disciplinary sciences are shown to be directly connected to the natural environment, and to the social

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<sup>390</sup> In Figure 11.1 this anthropocentric bias is subtly depicted by a straight arrow which runs directly from the society to the multi-disciplinary box, and which only picks up environmental concerns en route.

<sup>391</sup> While (traditional) economists may favour weak sustainability and environmentalists strong sustainability, this dichotomy may be seen as a debating short cut to a spectrum of positions ranging from very weak to very strong sustainability. (See Table 6.2 and also Norton, 2005: 310-316, and Davies, 2013.)

environment only by virtue of the fact of it being nested within the natural environment. Trans-disciplinary sciences are further characterised by their attempt at assessing *sustainability*, rather than the environmental or social impacts *per se*, and hence they are designated, in Figure 11.1, as being representative of strong sustainability, or ‘deep’ (*à la* Naess) sustainability.

While the depiction in Figure 11.1 might be said to oversimplify the immensely broad arena of academic endeavour, its message is to convey the position and nature of sustainability, as an academic sphere *vis-a-vis* other areas of academic enterprise. It is also believed that this depiction could aid in understanding the position of an educational offering or programme on the weak/strong sustainability spectrum. While Figure 11.1, by implication, stresses the need for holistic thinking and approaches, it is less forthcoming in terms of the role that the full PSDF can play in sustainability education, and hence this role can bear reiteration here. The PSDF, by claiming holism as a foundational principle, and by moving away from the inadequacies of a definitional approach to sustainable development, and in its place proposing an expanded framework of vision, values and principles, has the potential of being a vehicle for strong sustainability. As such it can philosophically undergird an educational programme in sustainability engineering, and, as has already been mentioned, provide an extensive range of pointers as to what the curriculum of such a programme should contain. The dimensional structure of the PSDF will also dictate that the curriculum cannot do less than give adequate coverage of the dimensions in its spread of academic offerings. This means that issues of the natural environment, (e.g. biodiversity) and social environment (e.g. health matters) have to be fully dealt with, and in addition there will have to be a sound grounding in economics (particularly in its ecological rendering). Issues of governance and organisational climate (the institutional dimension) also need to be dealt with. In the final instance it is the *integration* across these dimensions that will be a critical facet of any educational programme in sustainability engineering.

An overview of the general attitude, skills and knowledge (ASK) to be inculcated through a sustainability engineering programme are given in Box 11.1. This box represents the outcome of a workshop<sup>392</sup> on environmental engineering education, and it was the consensus of opinion amongst the participants in this workshop, that an educational programme in sustainability

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<sup>392</sup> This workshop, sponsored by UNESCO, *et al.*, on the *Fundamentals of Environmental Engineering Education* was held at the University of Canterbury, Christchurch, New Zealand, on 22-24 August 1994

engineering<sup>393</sup> needed to foster all the ASK elements in Box 11.1, but of these *attitude* was key.

The attitude involves:

- the maintenance of an open mind and broad awareness of societal issues;
- a commitment to leadership, sustainability, ethics and quality of life for all;
- a global responsibility, including utilisation of the best knowledge currently available, in solving problems;
- an appreciation of the values inherent in people and the biosphere; and
- an acceptance of the concepts of uncertainty, complexity and change.

The skills needed by the sustainability engineer were perceived to be:

- the ability to learn, listen and communicate;
- the development of a systems approach to thinking design and management; and
- appreciation of a balance between qualitative and quantitative assessment.

The knowledge base of the sustainability engineer must include:

- an understanding of the contextual setting of a problem;
- an understanding of the relevant science and engineering in the context of the social, economic and ecological environment in which that knowledge is applied;
- monitoring and assessment of environmental quality and standards;
- understanding of relevant legislation and policy; and
- ethics.

These are additional to the rigorous core knowledge traditionally required for professional engineers.

**BOX 11.1: THE ATTITUDE, SKILLS AND KNOWLEDGE NEEDED FOR SUSTAINABILITY ENGINEERING (From Elms & Wilkinson, 1995: 197)**

The abovementioned workshop also concluded that formal offerings aimed at the inculcation of ASK in sustainability engineering students should be introduced from the very beginning of their programme of studies. Case studies should be used to flesh out the ASK inputs. As the studies proceed the formal ASK inputs are to be gradually reduced while project-based learning increases. (See Figure 11.2.) Projects will obviously become increasingly complex and should reflect the ambiguities of real-life situations.

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<sup>393</sup> The term 'environmental engineering' was generally used in the workshop; at that time 'sustainability engineering', and even 'sustainable engineering', were not yet in use. A keynote speaker at the workshop did however assert that there was a "need for sustainability to underpin all engineering thinking" (Blakely, 1995: 12).

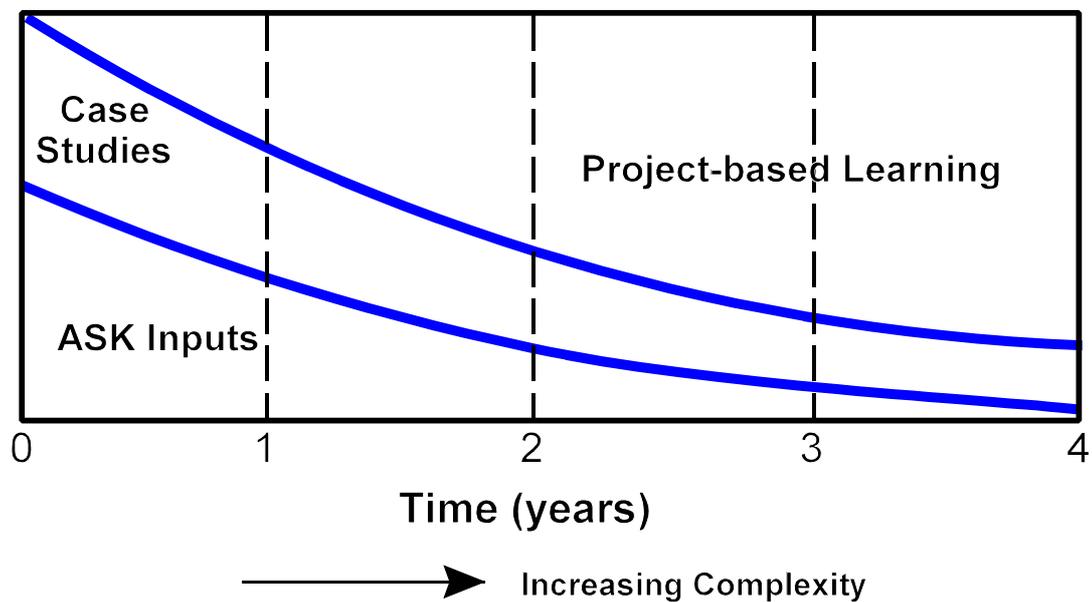
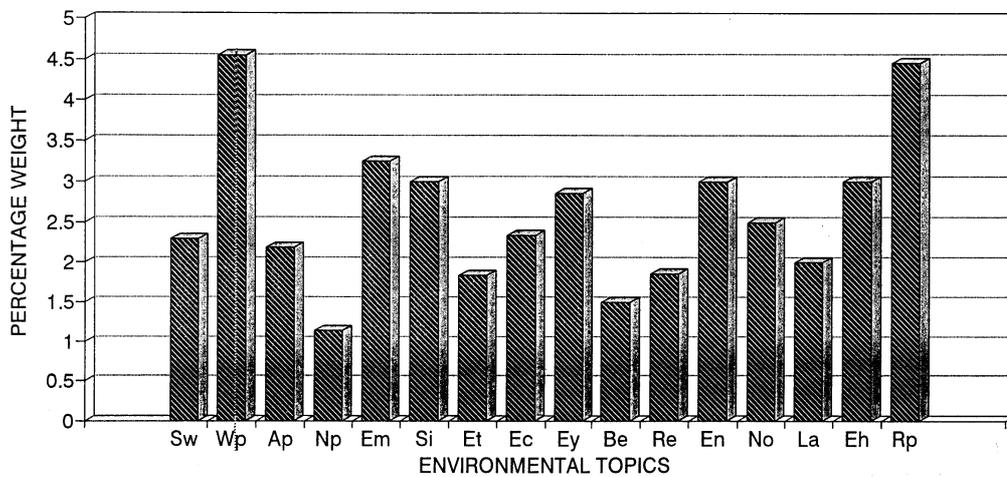


FIGURE 11.2: CORE OF SUSTAINABILITY STUDIES  
(After Elms & Wilkinson, 1995: 199)

While it has already been indicated that the finer curriculum detail for an educational programme in sustainability engineering is beyond the scope of this study, it may be of some value to just briefly overview some potential curriculum topics. An international survey conducted in the early 1990s identified the spread of topics in the environmental component of a number of environmental engineering courses on offer at the time, and the results of the survey are shown in summary in Figure 11.3. Given the date of the survey it would probably be correct to assume that most of the programmes from which the data in Figure 11.3 was derived, were multi-disciplinary programmes rather than trans-disciplinary, and that their sustainability focus was weak rather than strong. Nevertheless there is no reason to believe the topics of offerings in a strong sustainability educational programme will not, at least, include those listed in Figure 11.3. In addition, there would also have to be, in line with sentiments already expressed, a deliberate attempt at reducing any anthropocentric bias in the offerings, while at the same time fostering the integrative linkages between them. In this way one would hope to enhance the trans-disciplinary nature of the programme, and advance its potential at delivering those outcomes associated with strong sustainability.



KEY TO ENVIRONMENTAL TOPICS		
Ap = Atmospheric pollution	Et = Environmental ethics	Rp = Research project
Be = Built environment	Ey = Ecology	Si = Social Issues
Ec = Environmental economics	La = Law & legislation	Sw = Solid waste management
Eh = Environmental health	No = Noise	Wp = Water pollution
Em = Env. management	Np = Nuclear pollution	
En = Energy	Re = Resource engineering	

FIGURE 11.3: AVERAGE WEIGHT OF ENVIRONMENTAL TOPICS IN UNDER-GRADUATE ENVIRONMENTAL ENGINEERING PROGRAMMES (Long, 1994: 4.31)

The date of the survey on which Figure 11.3 is based may also explain the apparent low key treatment accorded to social and economic issues in the figure; it then was customary to pay more attention to environmental issues. It would in any case be inappropriate to lend much credence to the percentage weightings reflected in Figure 11.3; the latest environmental problem manifestations and the more modern conceptualisation of sustainable development could lead to different priorities.

Given not only the general perception that engineers are poor communicators, but also the appreciation that communication between professionals and communities, or between professionals from different disciplines, is integral to sustainability, it follows that communication skills will be a crucial component of any sustainability education programme for engineers. This is not only directly mandated by the participation principle of the PSDF, but also indirectly by most of the principles listed in the institutional dimension of the PSDF, which require cooperation between the various role players in sustainable development. In South Africa the communication problem is exacerbated by different cultural backgrounds, and the

fact that while English is the language most widely used in engineering practice, many engineering students are not English first language speakers. In many instances students are constrained not so much by their lack of technical knowledge as by their lack in communication skills. On a practical level the language skills of students can be improved directly by offerings in communication skills, and indirectly by building presentation assignments and group work into the curriculum. Group work also prepares students for their involvement in the multi-disciplinary teams they will ultimately need to work in. The participation principle (of the PSDF) can itself be fleshed out by role play exercises, and interview assignments.

Getting down, just for the moment, to the level of offering content, it follows from the preceding discussions, that apart from the more traditional topics such as pollution control, waste management and resource management (see Figure 11.3), techniques such as ecological footprinting, life cycle analysis, multi-criteria analysis, environmental impact assessment, risk assessment, etc. which flow from the spirit and detail of the PSDF, will have to be part of the sustainability studies for engineers. Woodhouse makes a case (in the context of overconsumption) to include “Industrial Ecology [IE] centrally into the curriculum” (2003: 127). According to Swarengen and Woodhouse IE aims at “minimizing anthropogenic perturbations to natural cycles” and “to move from linear throughput of raw materials in the economic system to a cyclic flow” (2003: 18).

A final comment on the curriculum of the sustainability education programme being outlined here relates to the fact that, in the final instance, it still is an *engineering* programme. As such it cannot do without the basic components that are part of any engineering programme. What comes to mind here are subjects such as mathematics, physics, chemistry, applied mechanics, engineering drawing, etc. With this final comment enough has now been said to indicate the direction in which more detailed curriculum proposals for an education programme in sustainability engineering should proceed.

In conclusion it may be reiterated that the notion that sustainability can simply be patched on to an existing engineering course is in some sense deficient; it can at best, it seems, only deliver weak sustainability. This is not to gainsay the need for environmental sensitivity and sustainability awareness to be an outcome of the education of all engineers. If this is

characterised as weak sustainability, it corresponds to Elms' environmentally educated engineering. But to produce true sustainability engineers, or Elms' environmentally involved engineers, the values and principles of sustainable development (e.g. as set out in the PSDF) will have to be core to the foundation on which the education of these engineers is built. Characteristic also of this type of education will be its holistic emphases or trans-disciplinary nature. Furthermore its scope will have to cover all the dimensions of sustainable development, in addition to communication skills and the traditional engineering components. The extent to which all these varied components can be welded into a whole and transferred as sustainability attitude, skills and knowledge, will determine the programme's success in being an educational vehicle for strong sustainability.

### **11.3.3 External issues**

While the foundational issues and academic issues discussed in the preceding sub-sections may be regarded as 'internal' issues or factors that influence the success or otherwise of educational programmes in sustainability engineering, there are also a number of 'external' factors that need to be considered.

#### *11.3.3.1 Engineering educators*

It goes without saying that an educational programme that aims at attitudinal change can hardly be successful if the educators in that programme are not themselves committed to the attitude in question. This could be a problem if, in an established engineering department (or faculty), educators in traditional engineering programmes are randomly tasked with the teaching of a 'new' sustainability engineering programme. According to Codner:

Engineering educators must understand what sustainability is, not feel threatened by it, and, particularly, not see it as a soft option that downgrades engineering technology or takes precious time away from hard engineering subjects within engineering degrees. This will require a shift in educational thinking. The problem is not easy to solve, since most academics relate very much to research in a specialist area and, therefore, do not have the time, or perhaps the interest, to keep in touch with international directions and thinking on sustainability. (1995: 61)

The statement, "Sustainability needs to be taught by sustainability converts", might (for engineers) sound too much like a religious truism, but what it implies is that if sustainability

practice requires a changed world-view, then at the very least one would expect that the educators in this field would subscribe to this new world-view.

On the other hand it is also the nature of academia that in higher education lecturers and professors are often inclined to ask critical questions about foundational issues. Some would argue that they, in fact, have a duty in this regard. For example Woodhouse, speaking in the context of overconsumption, makes the point that engineering educators, being less affected by commercial pressures, have more freedom, and hence more “personal responsibility to ask themselves hard questions about reform of engineering curricula” (2003: 129).

One may thus conclude that while not all engineering lecturers could become ideal sustainability engineering educators, it is possible that ‘sustainability infused’ individuals may be found in their ranks. These persons, once identified, must be given the latitude to become not only sustainability champions, but also programme leaders for the envisaged sustainability engineering programmes.

#### *11.3.3.2 Institutional arrangements*

It is hard to imagine that a sustainability engineering programme can be developed to its full potential in an institution that does not itself set sustainability as one of its primary focuses, or at least is open to such a possibility. From such an institutional focus it may be inferred that the top management of the institution in question will be sensitive to the peculiar characteristics and needs of these sustainability engineering programmes (some of which are raised in this chapter). It may be noted that at a 1990 conference twenty-two universities produced a declaration, the so-called *Talloires Declaration*, that expressed the “key actions institutions of higher education must take to create a sustainable future”.<sup>394</sup> Since that time the number of signatories has risen to 466. The Declaration requires, *inter alia*, that institutions must:

Create an Institutional Culture of Sustainability ....

Establish programs ... [that] ensure that all university graduates are environmentally literate and have the awareness and understanding to be ecologically responsible citizens.

... Create programs to develop the capability of university faculty to teach environmental literacy ...

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<sup>394</sup> See [http://www.ulsf.org/programs\\_talloires\\_history.html](http://www.ulsf.org/programs_talloires_history.html). [Accessed 5 February 2014]

Practice Institutional Ecology ... [by setting] an example of environmental responsibility by establishing institutional ecology policies and practices of resource conservation, recycling, waste reduction, and environmentally sound operations. (ULSF, 1990)

In Europe a great number of European universities have committed themselves to the *University Charter for Sustainable Development*, which is an instrument created by Copernicus, an inter-university co-operation programme on the environment.<sup>395</sup> This Copernicus driven charter calls, *inter alia*, for:

- institutional commitment to sustainable development
- the promotion of sustainable lifestyles among teaching staff, students and the public at large, and
- the establishment of educational programmes in environmental education.<sup>396</sup>

While there are still other initiatives from abroad in this regard,<sup>397</sup> the above brief overview confirms the view that the successful implementation of an educational programme aimed at sustainable development would significantly depend on the extent to which the institution as a whole engages with sustainability. With this perspective, a brief examination of the vision and mission statements, and where available, current strategic plans of a selection of South African universities,<sup>398</sup> has been carried out in order to assess to what degree the concept of sustainability has been integrated into their ethos and objectives. It may be mentioned that three of the universities included in this examination, have signed the *Talloires Declaration*.

While, as could be expected, most of the universities in question emphasize such traditional objectives as research expertise and academic excellence, many also value highly notions such as their ‘African-ness’, redress and diversity. Given the political past of this country and its

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<sup>395</sup> See <http://www.iisd.org/educate/declarat/coper.htm>. [Accessed 6 February 2014].

<sup>396</sup> See <http://www.unece.org/fileadmin/DAM/env/esd/information/COPERNICUS%20Guidelines.pdf>. [Accessed on 6 February 2014].

<sup>397</sup> See [http://www2.leuphana.de/vcse/uploads/media/Declarations\\_on\\_higher\\_education\\_and\\_sustainable\\_development.pdf](http://www2.leuphana.de/vcse/uploads/media/Declarations_on_higher_education_and_sustainable_development.pdf). [Accessed on 12 March 2014]

<sup>398</sup> For reasons that will be elaborated on later, the institutions referred to here are those that offer B.Sc.(Eng)/B.Eng type programmes in civil and/or environmental engineering.

skewed levels of wealth and privilege, one can understand such inclinations. Perhaps it is due, in some degree, to the pre-occupation with these latter values, that sustainability emerges as a relatively low-key priority.<sup>399</sup> This conclusion arises from the fact that in many instances the conceptualisation of sustainability is quite limited, and in most cases it does not appear to move much beyond the level of an ‘add-on’ to existing policies and plans. For example, in one instance the strategic plan of the institution reflects its desire to address “the problems of public schooling, climate change and sustainable development, violent crime, poverty, and unemployment”.<sup>400</sup> This limited view of sustainable development seems to undervalue its potential as an overriding concept which holistically encapsulates a vision, values and principles, as well as all the areas mentioned in the above quote. This points to an emasculated conceptualisation of sustainability. In contrast, one institution (the only one of those investigated) included sustainable development (implicitly as it is not mentioned by name) as a major thrust. It did so

by aligning its core activities with the following development themes from the international Millennium Development Goals:

- Eradicating poverty and related conditions
- Promoting human dignity and health
- Promoting democracy and human rights
- Promoting peace and security
- Promoting a sustainable environment and a competitive industry.<sup>401</sup>

Clearly all of the above themes are included in the fuller conceptualisation of sustainable development, as it has been promoted in this study. Yet if one has to be critical, one may feel some concern at the apparent lack of an overarching conceptualisation that would not only give the separate themes a collective thrust, but also add the requisite integrative aspect characteristic of sustainable development.

If, as has been suggested the South African universities are more inclined to find their priorities

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<sup>399</sup> This parallels a previously mentioned observation that the developmental priorities in developing countries tend to push environmental concerns into the background. This is also not to deny that sustainability institutes and suchlike exist at a number of the universities investigated.

<sup>400</sup> The Strategic Plan for the University of Cape Town 2010-2014, p14. Available at [https://www.uct.ac.za/downloads/uct.ac.za/about/goals/uct\\_strategic%20goals.pdf](https://www.uct.ac.za/downloads/uct.ac.za/about/goals/uct_strategic%20goals.pdf). [Accessed on 20 February 2013]

<sup>401</sup> HOPE Project, Stellenbosch University, Available at <http://thehopeproject.co.za/hope/abouthope/abouthopeprojects/Pages/About-Hope.aspx>. [Accessed on 20 February 2013]

in social developmental issues, it will be instructive to review, by way of comparison, the approach of a first world university that has taken sustainable development (in the fuller sense) up as a main priority. The choice here fell on Griffith University<sup>402</sup> in Brisbane, Australia. In its strategic plan this university has identified as one of its five high-level goals the following: “To be a *sustainable* university”.<sup>403</sup> It elaborates on this high-level goal by providing subsidiary goals and targets. These are reproduced in Table 11.1.

TABLE 11.1: GOALS AND TARGETS TO BE A SUSTAINABLE UNIVERSITY <sup>404</sup>

GOALS	TARGETS
1. To operate as a sustainable organisation	To ensure the financial security of the University each year To grow the quantum and proportion of income from philanthropy
2. To achieve or exceed best practice in environmentally efficient operations, and to be an exemplar to the community	To reduce waste to landfill and increase recycling by 5% per EFTSL* per year To maintain water and electricity consumption at or below sector average To identify sustainable transport strategies for each campus To include principles of sustainability in the design of all new Griffith building developments
3. To enhance our reputation for research related to sustainability	To expand our portfolio of research projects relating to sustainability
4. To develop high quality teaching programs relevant to sustainability	To increase the proportion of degree programs with significant content related to sustainability

\*EFTSL = Equivalent Full Time Student Load.

It is of interest to note that for this institution sustainability is to be pursued on two levels, firstly in the running of the institution itself, and then secondly in its academic endeavours. With respect to the latter the university already offers “40 teaching programs and courses centred on sustainability” together with which it has “a comprehensive sustainability research profile”.<sup>405</sup> To lend further support to its sustainability goal the university has developed a detailed sustainability plan and a sustainability policy.

<sup>402</sup> It will become apparent later in this chapter why Griffith University was considered.

<sup>403</sup> Griffith University: Strategic Plan 2013 – 2017, p2. Available at [http://www.griffith.edu.au/\\_data/assets/pdf\\_file/0010/475552/Strategic\\_Plan\\_2013-2017.pdf](http://www.griffith.edu.au/_data/assets/pdf_file/0010/475552/Strategic_Plan_2013-2017.pdf). [Accessed on 20 February 2013]

<sup>404</sup> Ibid. p10.

<sup>405</sup> Ibid. p10.

Returning to the South African situation one may conclude that the broad institutional factors that would promote the successful establishment of a sustainability engineering programme are not as positive as they could be. Failing an institutional focus on sustainability, the success of establishing a sustainability engineering programme in an institution will, because of its unique requirements, such as those which are still to be touched on here below, depend in the least, on the availability of a ‘sustainability converted’ individual within the top management of the institution, who could promote its cause.

On a practical level one of the problem areas that programmes in sustainability engineering have to address is the inherent multi-disciplinary<sup>406</sup> character of these programmes, which could be seriously hampered in an institution that functions largely along disciplinary lines. Single-discipline departments often have difficulty in sharing staff, facilities and funds across departmental and faculty boundaries (Codner, 1995: 63). If a department of sustainability engineering were to be staffed by sustainability engineers, as some might think is implied in the preceding sub-section, one could argue that such staff would largely be able to meet the multi-disciplinary requirements of the departmental programmes. But there is a subtle problem in this solution; if it is the aim of a multi-disciplinary programme to bring together *diverse* disciplines to be presented by persons with expertise in these disciplines, will this aim not be somewhat diluted?

Another institutional question that requires some thought is whether a programme or a department of sustainability engineering should be located within a faculty of engineering. If traditional engineering programmes are rooted in a world-view that is different to the one that undergirds a sustainability engineering programme, can they all find a home in the same faculty? Woodhouse mentions, in the context of engineering education, the case of an “inter-school major ... designed to blend social considerations with technical from the introductory courses to the capstone projects” where the “program chair is located in a social science department” (2003: 127). Of course, if, in the longer term, all engineering programmes in an engineering faculty were to adopt the sustainability ethic as fundamental to their particular branch of engineering, the question of the location of the sustainability engineering programme

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<sup>406</sup> The term ‘multi-disciplinary’ is used generically here, and not in the more narrow sense as Ashford defined it (2004: 244).

is rendered superfluous.

### 11.3.3.3 Professional practice

While the issues to be discussed in this sub-section do not deal directly with the sustainability education of engineers, they do nevertheless exert a strong influence on the viability of the educational programmes in this domain.

In most countries where the engineers are professionally registered, the institutions responsible for their training and education are officially accredited; this means that their engineering programmes are regularly subject to a quality control exercise by external reviewers. It follows that (new) sustainability engineering programmes will also need the official accreditation if the graduates of these programmes are to be registrable. A problem that might arise here resides in the fact that the point of departure (ethos, world-view) of sustainability engineering (as it is here envisaged) is significantly different to that of the traditional engineering disciplines. It has been mentioned in the previous chapter that the Engineering Council of South Africa (ECSA) is the official body responsible for the registering of engineering professionals in South Africa. It is also its duty to accredit the educational programmes in engineering, in South Africa. In order to do these tasks ECSA makes use of senior practising engineers. Thus it is likely that the accreditation of sustainability engineering programmes will be done, at least initially, by (older) engineers who do not necessarily believe that the sustainability ethic is *fundamental* to engineering. Hard traditionalists may be prejudiced against what they perceive as a ‘soft option’.

Another aspect of registration which may be problematical relates to the competencies which are expected of engineering professionals. At present a set of generic competency outcomes, which does not distinguish between the various engineering disciplines, is prescribed by ECSA.<sup>407</sup> In the context of this study it is necessary to assess the suitability of these generic competency outcomes with respect to sustainability engineering. The outcomes that ECSA expects for registration as a professional engineer are listed in Figure 11.4 below. (Other grades of registration, such as a professional engineering technologist and a professional engineering technician are also dealt with by ECSA, but for the sake of the discussion here, it will not be

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<sup>407</sup> Allowance is made for additional discipline specific prescriptions.

considered necessary to deal with these grades in their own right; their tenor would in any case be quite similar to that of the professional engineers.)

<b>Essential Activities of Professional Engineers</b>	<b>Using Enabling Knowledge</b>	<b>Taking Account of Consequences</b>	<b>Exercising Judgement and Taking Responsibility</b>	<b>Developing own Competency</b>
<p><b>1:</b> Define, investigate and analyse complex engineering problems.</p> <p><b>2:</b> Design or develop solutions to complex engineering problems.</p>	<p><b>3:</b> Comprehend and apply advanced knowledge of the widely-applied principles underpinning good engineering practice, specialist knowledge and knowledge specific to the jurisdiction and local conditions.</p>	<p><b>6:</b> Recognise and address the reasonably foreseeable social, cultural and environmental effects of complex engineering activities.</p> <p><b>7:</b> Meet all legal and regulatory requirements and protect the health and safety of persons in the course of his or her complex engineering activities.</p>	<p><b>8:</b> Conduct engineering activities ethically.</p> <p><b>9:</b> Exercise sound judgement in the course of complex engineering activities.</p> <p><b>10:</b> Be responsible for making decisions on part or all of complex engineering activities.</p>	<p><b>11:</b> Undertake professional development activities sufficient to maintain and extend his or her competence</p>
<p><b>4:</b> Manage part or all of one or more complex engineering activities.</p>				
<p><b>5:</b> Communicate clearly with others in the course of his or her engineering activities.</p>				

FIGURE 11.4: COMPETENCY OUTCOMES SPECIFIED BY ECSA FOR REGISTRATION AS A PROFESSIONAL ENGINEER (After ECSA, 2012a: 3)

Initially it might seem, after perusing the required competencies for registration as presented in Figure 11.4, that sustainability issues are dealt with credibly. Professional engineers are required to take into account the “foreseeable social, cultural and environmental effects” of engineering activities (#6). This requirement is then further expanded by ECSA to include:

- (a) Direct and indirect, immediate and long-term effects of engineering solutions;
- (b) Application of principles of sustainability. (ECSA, 2011: 3)

It is furthermore required of professional engineers to conduct their activities ethically (#8), to exercise sound judgement (#9) and to take responsibility for engineering activities (#10). A thread running through these competency outcomes is the focus on solving complex (engineering) problems. The need for good communication is also a specific outcome (#5); the

targets of the communication is to include: “peers, superiors, persons implementing designs and other work, persons in other disciplines, clients and wider stakeholders” (ECSA, 2011: 3).

Taken together, all of the above points, indicate a rather fair coverage of sustainability criteria, as for example, expressed through the PSDF principles. But a second, more critical perusal of the ECSA competencies might come to a less sanguine conclusion. It can be argued, for example, that sustainability is only covered by implication in the ECSA competencies; it does not emerge explicitly from Figure 11.4 as a main plank of engineering. Also, one again comes across, in the ECSA document, the glib reference to “the principles of sustainability” without further elaboration on what these principles may be. More subtle may be the criticism that the outcomes speak of ‘complex *engineering* problems’, whereas a sustainability engineer’s concern is perhaps more about complex *sustainability* problems. Some environmentalists might argue that it is exactly some of the ‘complex *engineering* activities’ that give rise to environmental problems. Thus, to sum the situation up succinctly: ECSA does not use sustainability as the point of departure for its registration competencies. And so one may conclude that the ECSA registration competencies tend rather towards ‘weak sustainability’, and as such are more suitable for those whom Elms has designated as “environmentally educated engineers” (1995a: 3). By the same reasoning it can be said that the ECSA competencies fall short of what would be required for ‘strong sustainability’, and thus would not be suitable for sustainability engineers, or “environmentally involved engineers” (to use Elms’ designation again). In the first category, engineers are looking at incorporating sustainability ideas into their engineering practice, while engineers in the second category (sustainability engineers) are more concerned about forging engineering practice around sustainability as a central principle. If then sustainability engineering practice is premised differently, compared to traditional engineering practice, it seems that, for registration and accreditation purposes, ECSA will have to look at a set of sustainability engineering competencies that is likewise premised differently compared to the current set.

On a broader front it must also be noted that the professional acceptance of sustainability engineering does not necessarily imply industry recognition. It goes without saying that educational programmes in sustainability engineering will soon become moribund if the graduates of these programmes cannot find employment positions (with competitive

remuneration). In countries with high developmental needs (such as is the case in South Africa) the temptation is always there to water down sustainability norms in order to fast track developments. In the final instance it is a governmental responsibility to ensure that this does not happen, and therefore one can expect a need to exist in government structures to employ sustainability professionals in a watchdog role (and also in an advocacy role). This need is underlined by the fact that the building of institutional capacity falls squarely within one of the four dimensions of sustainable development as it is articulated in the PSDF. Thus one could expect that sustainability engineers would initially find employment in the public sector, and then as the practice of sustainability engineering became more established, employment opportunities would open up in the private sector. Educational institutions that venture into the training of sustainability engineers may initially also have to assume an advocacy role in this regard, in order to promote the establishment of employment opportunities for their graduates.

#### 11.4 THE PATH TO SUSTAINABILITY ENGINEERING EDUCATION IN SA

So far then it has been concluded that engineering education may be directed towards sustainability at two levels; the first level (that of the ‘environmentally educated engineer’ according to Elms) is characterised by sustainability (environmental) modules being *added on* to existing engineering curricula and it is said to produce weak sustainability. The second level (that of the ‘environmentally involved engineer’ according to Elms) is one where sustainability is the *main pillar* of the course, and the engineering components of the course are built around this pillar, and as such it is said to produce strong sustainability.<sup>408</sup> With this background it is the objective in this sub-section to review the current situation with respect to engineering<sup>409</sup> educational programmes in South Africa in order to assess what should be done to promote sustainability engineering education in this country. Two approaches will be followed here; firstly the accreditation standards applicable to engineering programmes in South

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<sup>408</sup> It may be reiterated that the weak/strong sustainability dichotomy is used here mainly as a rhetorical device, and that these designations are not essentially (but quite likely) related to the use of the same terms in the economic dimension (see §6.2.1). Furthermore in practice it is probable that engineering educational programmes could be judged to fall somewhere on a spectrum of which weak and strong sustainability are the opposite ends.

<sup>409</sup> The emphasis will fall on civil engineering programmes, with the assumption that the sustainability ‘status’ of the educational programmes of the other engineering disciplines will not be much different, and if anything less oriented towards sustainability. Ideally it is actually ‘environmental’ engineering programmes that would be of central interest here, but as these are not in abundance in South Africa, the discussion falls back on civil engineering programmes.

Africa will be investigated, and secondly the curricula of the various (civil) engineering programmes on offer in the country will be investigated and compared. Finally some proposals will be made in terms of sustainability engineering education in South Africa.

#### **11.4.1 Accreditation standards for engineering education in South Africa**

On an official level ECSA not only prescribes, as has been mentioned, a certain standard of conduct for South African engineering professionals through the setting of a code of ethics and competency standards for registration, but it also prescribes the standard of education for these professionals. It does this by accrediting the engineering programmes offered by the various higher education institutions in South Africa. (The quality control of all higher education programmes in South Africa falls under the jurisdiction of the Council on Higher Education (CHE), but in the case of engineering programmes, the accreditation process of ECSA also satisfies the requirements of the CHE.) The accreditation process involves on-site inspections by ECSA appointed persons, the objective of the inspections being to assess the quality of the engineering education offered at each of the institutions. In the main it is B.Sc.(Eng)/B.Eng, B.Tech and National Diploma programmes in engineering that are subject to the scrutiny of ECSA. As the format of the latter two types of programmes is being reconsidered at present, and as the accreditation requirements of all of the these programmes (at least from a sustainability point of view), will have much in common, it is mainly the B.Sc.(Eng)/B.Eng type programmes that will be considered in the following discussion.

The first point that should be made in reviewing the ECSA accreditation criteria is that these are generic, in the sense that they apply across all the branches of engineering. While the descriptor 'environmental' is one of many branches of engineering recognised in the ECSA Qualification Standard (ECSA, 2004: 1),<sup>410</sup> in the list of current engineering programmes that have been accredited by ECSA (ECSA, 2012b), only one uses this descriptor, and then only as a sub-branch of civil engineering.<sup>411</sup> It may be concluded that no current B.Sc.(Eng)/B.Eng type

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<sup>410</sup> The full name of this document is: *Whole Qualification Standard for Bachelor of Science in Engineering (BSc(Eng))/Bachelors of Engineering (BEng): NQF Level 7* (ECSA, 2004).

<sup>411</sup> Strangely enough, it appears from the latest prospectus of the institution concerned that this option has been discontinued.

programmes could be considered as having a singular focus on environmental engineering. It may be reiterated here that environmental engineering is a designation that may correspond to what in this study has been called sustainability engineering, but then only if ‘environmental’ is broadly interpreted. The generic knowledge areas to be covered in B.Sc.(Eng)/B.Eng programmes according to the ECSA Qualification Standard, are as listed in Table 11.2.

TABLE 11.2: KNOWLEDGE AREAS FOR ENGINEERING PROGRAMMES  
(After ECSA: 2004: 2&9)

Knowledge Areas	Description
Mathematical Sciences	Mathematics, numerical analysis, statistics and aspects of computer science cast in an appropriate mathematical formalism.
Basic Sciences	Physics (including mechanics), chemistry, earth sciences and the biological sciences, as applicable in each engineering disciplinary context.
Engineering Sciences	Engineering applications, rooted in the mathematical and physical sciences, aimed at solving engineering problems.
Design and Synthesis	Creative process requiring the integration of engineering, basic and mathematical sciences, taking into account economic, health and safety, social and environmental factors, codes and laws.
Computing and IT	The use of computers, networking and software to support engineering activity.
Complementary studies	Disciplines outside of engineering & basic sciences and mathematics which: (a) are essential part of engineering, e.g. economics, the impact of technology on society and effective communication; and (b) broaden the student's perspective in the humanities.

Despite such oblique references as “earth sciences and biological sciences”, “taking into account ... environmental factors” and “broaden ... perspective in the humanities”, all of which are aspects of sustainability, it cannot be said from Table 11.2 that sustainable development is a major component of South African engineering degrees. If attention is turned to the exit level outcomes that ECSA prescribes for an engineering degree, a picture of engineering competence emerges, as one would expect, but again the evidence of sustainability competence is relatively low key, and mostly only by implication. See Table 11.3. The learning outcome for exit level outcome 7 (out of 10) does call for “*critical awareness* of the impact of engineering activity on the social, ... and physical environment”, but is being only ‘critically aware’ enough to advance true sustainability? This outcome together with exit level outcome 8, which requires the ability to work in multi-disciplinary teams, are certainly what one would expect to be in the

arsenal of a sustainability engineer, but as was the case with the ECSA knowledge areas, it is not enough to convince one that sustainable development is a required foundation stone for South African engineering programmes.

TABLE 11.3: EXIT LEVEL OUTCOMES FOR ENGINEERING DEGREES  
(After ECSA, 2004: 4-7)

Exit Level Outcome	Learning Outcome
1: Problem solving	Demonstrate competence to identify, assess, formulate and solve <i>convergent</i> and <i>divergent</i> engineering problems creatively and innovatively.
2: Application of scientific and engineering knowledge	Demonstrate competence to apply knowledge of mathematics, basic science and engineering sciences from first principles to solve engineering problems.
3: Engineering Design	Demonstrate competence to perform creative, <i>procedural</i> and design and synthesis of components, systems, engineering works, products or processes.
4: Investigations, experiments and data analysis	Demonstrate competence to design and conduct investigations and experiments.
5: Engineering methods, skills and tools, including Information Technology	Demonstrate competence to use appropriate engineering methods, <i>skills</i> and tools, including those based on information technology.
6: Professional and technical communication	Demonstrate competence to communicate effectively, both orally and in writing, with engineering audiences and the community at large.
7: Impact of Engineering activity	Demonstrate <i>critical awareness</i> of the impact of engineering activity on the social, industrial and physical environment.
8: Individual, team and multidisciplinary working	Demonstrate competence to work effectively as an individual, in teams and in multidisciplinary environments.
9: Independent learning ability	Demonstrate competence to engage in independent learning through well developed learning skills.
10: Engineering Professionalism	Demonstrate <i>critical awareness</i> of the need to act professionally and ethically and to exercise judgment and take responsibility within own limits of competence.

If then, on face value, Table 11.3 does not convince as a vehicle for sustainable development, it is necessary to probe deeper into the assessment criteria and range statements that ECSA provides for each of the exit level outcomes. For outcome 3, for example, ECSA requires candidate engineers, as part of their designs, to assess the “impacts and benefits of the design ... [on the] social, legal, health, safety, and environmental” domains (ECSA, 2004: 5). Proceeding to the range statement for outcome 5; it requires candidate engineers to be skilled in, *inter alia*, the “[b]asic techniques from economics, business management, and health, safety and environmental protection” (ECSA, 2004: 6). Exit level outcome 7, which has already been

referred to here above, is expanded through four ‘associated assessment criteria’ as follows:

The candidate identifies and deals with an appropriate combination of issues in:

1. The impact of technology on society;
2. Occupational and public health and safety;
3. Impacts on the physical environment;
4. The personal, social, cultural values and requirements of those affected by engineering activity. (ECSA 2004: 6)

The assessment criteria of both exit level outcomes 6 and 8 call for communication skills, be these written or oral, and between team members or across disciplinary boundaries. While all of these requirements are to be found in sound sustainability practice, they do not individually or collectively constitute the full picture of sustainable development. There is no mention of sustainability as such in any of the assessment criteria or range statements. One may thus conclude that there might be scope in the ECSA prescriptions to accommodate the weak sustainability that is associated with “environmentally educated engineers” or general engineers (Elms, 1995a: 3). However it appears that the themes of holism and complexity (as spelt out earlier in this chapter), and the other fundamental sustainability values and principles as presented in the PSDF, will need to come through much more prominently and clearly, if strong sustainability is to be the result. One could thus argue that an alternative or amended standard is needed for a sustainability engineering degree, and maybe this is not unexpected if the sustainability engineering is to satisfy the call for the inculcation of a new world-view, that is to say, one which would be different from the techno-economic view that underlies traditional engineering approaches. It is not the intention here to formulate this new standard; it will suffice to say that the new standard, must probably include all of the topics of the existing standard, but furthermore, that it must reflect a primary orientation towards sustainability, and be broad enough to encapsulate the vision and all the values and principles of sustainable development as they are spelt out in the PSDF, for example.

#### **11.4.2 Review of the curricula of relevant engineering programmes**

The purpose of this review is to highlight the environmental/sustainability components of the current civil (and environmental) engineering curricula (in mainly South Africa). It is the curricula of B.Sc.(Eng)/B.Eng type programmes in civil engineering will be reviewed here, and not, for reasons that have already been mentioned, those of the National Diploma and B.Tech

programmes in civil engineering. These latter programmes are in any case quite compact programmes with a narrow focus on engineering which leaves little if any space for environmental or sustainability offerings.<sup>412</sup> It must be mentioned though that in the 1990s the B.Tech programme in civil engineering was expanded to include an environmental engineering option. The writer was largely responsible for this development, and it was the first tertiary programme in environmental engineering in South Africa (which emerged from a civil engineering foundation), and apparently is at present still the only one. After the review of civil engineering programmes, the discussion will move on to a consideration of environmental engineering programmes.

A summary of the curricula of the B.Sc.(Eng)/B.Eng type programmes in civil engineering on offer in South Africa is presented in Appendix O1. Environmental and sustainability offerings have been highlighted.<sup>413</sup> It is evident then that out of the forty or so offerings that make up each of these programmes only two or three offerings can be considered as sustainability or environmentally orientated. It would thus be hard to argue, given the paucity of these offerings, that sustainability is a main plank of these programmes. Not all of the sources used in this review are, other than in very general and broad brush strokes, explicit about the objectives or outcomes of the respective programmes, and where these are given in more detail, they mostly reflect quite closely the ECSA outcomes. (See Table 11.3.) This is not surprising as these programmes are obviously designed to gain ECSA accreditation. As a result one can expect the critique that was expressed about the ECSA outcomes with respect to sustainability, to apply to the reviewed programmes as well. All in all the conclusion is then that in South African civil engineering curricula sustainability is encountered mostly as an add-on, and that at best these curricula produce weak sustainability.

By way of comparison summaries of the curricula of three environmental engineering programmes are reproduced in Appendix O2. Two of these programmes are from a first world country (Australia), while the third one is from a developing country (South Africa). It is not

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<sup>412</sup> These programmes date from the time when the Department of National Education still controlled the curricula and hence they are uniform across the country.

<sup>413</sup> While it is quite feasible that the syllabi of some of the other offerings might include environmental and sustainability components, in the highlighted offerings these themes are the primary or only themes. Furthermore it may be said that the review is more about trends than an accurate analysis.

the intention here to make an unfavourable comparison between *civil* engineering programmes (Appendix O1) and *environmental* engineering programmes (Appendix O2), the curricula of the latter which one would in any case expect to exhibit considerably more environmental/sustainability offerings. Nor is it the intention to play off the higher level of environmental sensitivity of a developed country against that of a developing country. Rather the objective is to put up exemplars of programmes that could be considered to be close to, if not within, the paradigm of strong sustainability.

In order to provide some background to the programmes included in Appendix O2 it is appropriate to provide some explanatory comments here. The writer was privileged to make a study tour of Australia and New Zealand in 1999, and one of the purposes of this tour was to investigate the offering of environmental engineering programmes in these countries. It may be worth listing some of the conclusions drawn from the report of this study tour:<sup>414</sup>

- Environmental engineering programmes were generally developed in response to heightened environmental awareness amongst engineers and the general community.
- It was also seen as a niche market by some institutions.
- In most cases there was at least one very committed individual that drove the introduction and continuation of the environmental engineering programmes.
- The programmes ranged from those with a traditional engineering perspective where the programme still maintained a strong engineering flavour, to programmes with a stronger humanities emphasis.
- Some of the latter type of programmes were (initially) developed outside of an engineering department.
- While being relatively young programmes (at the time), it was maintained that most environmental engineering graduates found employment, although quite a lot of

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<sup>414</sup> Long, S. S., 1999. Report on a study tour undertaken to Australia and New Zealand. Unpublished report.

marketing had to be done.

- Environmental engineering was recognised as a discipline, and thus all the environmental engineering graduates were registrable.

It may be noted that the two levels or intensities of environmental orientation, previously characterised as weak and strong sustainability was evident here too. The writer was able to visit Griffith University and also meet with the programme leader of the environmental engineering programme at Monash University, and that accounts for the choice of the first two programmes listed in Appendix O2. Of the two it would appear that the Griffith University programme is closer to the strong sustainability end of the weak/strong sustainability spectrum. The particular campus of Griffith University that the writer visited, also reflected the strong sustainability orientation of the institution as a whole. (This accounts for the earlier choice of Griffith University (see §11.3.3.2) as an example of an institution with a high level of commitment to sustainability.)

Following on from this study tour the writer made proposals for the introduction of a bachelor degree in environmental engineering at the then Port Elizabeth Technikon. The curriculum of this proposed degree is the third programme presented in Appendix O2. For strategic reasons this programme was so constituted that (at least initially) it was made up from existing subjects in the curriculum of the National Diploma in Civil Engineering, and the curriculums of the Water and Environmental Engineering options of the B.Tech degree in Civil Engineering. It thus contained only a minimal number of completely new offerings which were added to address some obvious discrepancies. This programme, although accepted in principle by the institution, was never run for reasons which included inadequate funding, lack of firm top management support and low demand.

The environmental/sustainability offerings of the programmes listed in Appendix O2 have been highlighted; the remainder are what may be considered traditional engineering offerings. It is thus immediately evident that each curriculum includes a significant number of environmental/sustainability offerings, and importantly that these feature throughout the programme, from the first year of study up. Also evident are offerings that are clearly rooted

in the humanities. To a lesser degree this latter trend is also evident in engineering programmes generally. ECSA, for example, sets a certain minimum level in so-called complementary studies, which are defined as:

those disciplines outside of engineering sciences, basic sciences and mathematics which: (a) are essential to the practice of engineering, including engineering economics, the impact of technology on society and effective communication; and (b) broaden the student's perspective in the humanities or social sciences to support an understanding of the world. (ECSA, 2004: 9)

But sustainability engineering is more than this; the holistic, trans-disciplinary requirements, the complex systems approach, the value changing thrust, and most importantly the establishment of sustainable development as a fundamental tenet of the whole programme, are all characteristic of sustainability engineering. It is the collective impact of all of the aforementioned characteristics that propel an education programme in sustainability to the level of strong sustainability.

While it is quite evident that sustainable development as a concept features to some degree in the curriculums of many current education programmes in engineering, it is the lack of an explicit commitment to sustainability as a cornerstone of the programme that limits them to the level of weak sustainability. All three of the programmes included in Appendix O2 reflect this commitment to sustainability in their introductions (more so in the case of the first two). One could say that the concept of sustainable development needs to become a *threshold concept*. Sibanda, *et al.* (based on the work of Meyer and Land) characterise a threshold concept as follows:

Threshold concepts can be *transformative*, in that once acquired they may shift the way an individual views a certain subject or the world. Secondly, threshold concepts are probably *irreversible* as they are difficult to unlearn. Thirdly, threshold concepts are likely to be *integrative*. If a student has understood a threshold concept, they are more likely to integrate different aspects of the subject ... a threshold concept can be *bounded* in that it helps define the boundaries of a subject area. Lastly, there is a possibility that when threshold concepts exist, they may be *troublesome* for students ... in that [they may conflict] with the individual's previous ideas and also involve ... letting go of previous comfortable positions. (2011:206-207, 209)

In a survey reported on by Sibanda, *et al.*, (2011) post-graduate engineering students were questioned as to how they experienced the concept of sustainable development as it came to

them through their previous studies. The survey showed that all of the above characteristics of a threshold concept, with the exception of the boundedness, was experienced, although in varying degrees, by all of the students surveyed. Taking into account the holistic nature of sustainable development and the wide ambit of the concept, the lack of boundedness experienced by the students does not surprise. The conclusion drawn here is that if all of these characteristics of a threshold concept (with the exclusion of boundedness) apply to the concept of sustainable development, this must be even more substantially the case for a programme in sustainability engineering. Thus the treatment of sustainable development as an 'add-on' to existing curricula is clearly a quite limited approach, and one which is not capable of producing the threshold crossing experiences of a programme aimed at strong sustainability.

#### **11.4.3 Guidelines for an educational programme in sustainability engineering**

While it is evident that education in sustainability engineering is not an entirely novel concept, it is also clear that its parameters are still being wrestled with, and its establishment as an engineering discipline is by no means generally realised. While in South Africa sustainability has not yet emerged as a main principle or discipline of engineering, it appears that much thinking and debate around the notion of sustainability engineering education has already taken place in Australasia and Europe. The workshop that led to the publication of *The Environmentally Educated Engineer* (Elms & Wilkinson, 1995) has already been mentioned and referred to in this study. In Europe a group of engineering educators from three Technological Universities established the *Engineering Education for Sustainable Development* (EESD) initiative that, in the spirit of the *United Nations Decade of Education for Sustainable Development* (2005-2014) set up a vehicle for monitoring EESD at participating higher education institutions. First of all they established, in 2004, a qualitative standard that goes by the name of the *Declaration of Barcelona* (EESD, 2004), and periodically since then, voluntary surveys have been conducted to establish how institutions measure up against this standard (EESD, 2006; EESD, 2009). While it appears that this assessment procedure has lost some steam, the notion of EESD has not, and in 2013 a further conference with this focus, named *Rethinking the Engineer*, took place in Cambridge, UK.<sup>415</sup> For illustrative purposes the *Declaration of Barcelona* is appended to this study (Appendix P). While the focusses of the

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<sup>415</sup> See <http://www-eesd13.eng.cam.ac.uk/> [Accessed 5 February 2014].

Barcelona Declaration and the PSDF are not exactly the same, the latter being focussed on *sustainable development* and the former on *engineering education* for sustainable development, they are, for comparative purposes, juxtaposed in Appendix P. Once again it appears that the PSDF correlates (in those areas where comparisons are feasible) very adequately with the Barcelona Declaration.

If it is accepted that there are no degree programmes in (strong) sustainability engineering in South Africa at the moment, the following questions arise: What pre-conditions govern the establishment of such programmes, and what guidelines govern their format? The following summary of the main points previously made, would go some way towards addressing these questions.

(a) National climate

It has been noted previously that there appears to be less urgency about environmental or sustainability matters in developing countries than in developed countries; developing countries have more immediate concerns about the social conditions that prevail in these countries. This trend is evident in, for example, in the National Development Plan (NDP) (South Africa, 2011), recently produced in South Africa, and which reflects a discernable bias towards social issues.<sup>416</sup> The point being made here is that the establishment of a programme in sustainability engineering in South Africa is complicated by the fact that sustainable development is not, as yet, a prime concern of the country. If it were then, for example, the employment opportunities for sustainability engineers (in their field of expertise) would be plentiful; in the present circumstances they appear to be quite minimal. This seems to be the case even in the government service, where it is, after all, the national responsibility to improve social conditions *and* to protect the environment. On a professional level, it will be required of the engineering profession, in this case ECSA, to acknowledge sustainability engineering as a recognised branch of engineering, with the understanding that its point of departure would be different from the other traditional engineering disciplines.

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<sup>416</sup> To be fair sustainable development is considered in the NDP, but the criticism may be that it is seen as a separate issue, as opposed to the holistic understanding that sees social issues as integral to sustainable development. In this understanding, the NDP would have been better expressed as a more comprehensive National *Sustainable* Development Plan.

(b) Institutional climate

It has been argued previously that a tertiary institution, with an explicit commitment to sustainable development, would be a natural home for a programme in sustainability engineering. Failing that, the successful introduction of such a programme will require some individuals in the institution to be whole-heartedly committed to the cause; one at the level of top management, and also a ‘champion’ at departmental level. In an European assessment of the status of engineering education for sustainable development (EESD) it was reported that in the most successful institutions in this regard “a supportive core of academics can be identified within the university, champions who have worked hard to coordinate the learning activities in EESD” (EESD, 2006: 4). Issues such as the multi-disciplinary (or trans-disciplinary, to use Ashford’s terminology) nature of the programme will require special attention. The location of the programme in the organisational structure of the institution, as well as its physical location are also issues of special consideration. It has been mentioned that a location somewhat remote, organisationally and physically, from the engineering faculty might hold some advantage for the programme (at least initially). It goes without saying that if the foundational values of sustainable development are to be inculcated in the students entered into this programme, then the lecturing staff themselves would have to be clear about what these values are, and believe in them.

(c) Programme philosophy

A deep and broad understanding of sustainable development would have to inform any educational programme in sustainability engineering, and as such its philosophy and principles will need to be clearly articulated. It is proposed here that the PSDF, as set out in Appendix F, could adequately be the point of reference in this regard. This framework not only articulates the vision and values that can support an ‘ecological’ world-view, but the principles of sustainable development, as they are formulated in the framework, are also, to a large degree, prescriptive with respect to the content of the curriculum for a sustainability engineering programme. In short the PSDF has both the depth and width to be a comprehensive guide for an educational programme in sustainability engineering.

(d) Curriculum

The environmental engineering curriculums that have been reviewed here above give one some

idea of what would be covered in the curriculum of a programme in sustainability engineering. Traditional environmental engineering topics such as waste management, water and waste water treatment, resource management, environmental assessment, etc., will obviously have to find a place in the curriculum, albeit now from a sustainability perspective. In addition the curriculum must also allow for topics more closely associated with sustainability and its assessment, e.g. complexity theory, ecological economics, environmental risk assessments, ecological footprinting, life cycle analyses, multi-criteria decision analyses, etc. It goes without saying that a sustainability engineering programme will need to have, in common with the other engineering disciplines, a sound foundation in mathematics and science and other basic engineering subjects, but then more uniquely, it also needs to have a firm footing in the humanities; in areas such as ethics, sociology and development studies, for example. What a simple listing of the topics to be covered in the curriculum may not convey is the sustainability ethos that must run like a thread through the programme from first year level through to the final year. Here one thinks of, for example, the holism, the respect for life, and the fairness principles.

## 11.5 CONCLUSION

The initial objective of this chapter was to determine how civil engineers, through their education, could respond to the challenge of sustainable development. It was found that the response could be on two levels. On one level the outcome would be a weaker strain of sustainability, that could be made to apply to all civil engineering programmes.<sup>417</sup> This is achieved by including sustainability as an additional focus of a civil engineering programme, thereby broadening it, but without necessarily changing its fundamental *raison d'être*. On the other hand, if strong sustainability is to become the focus, this would require a new approach, here named *sustainability engineering*. In essence sustainability engineering is a new branch of engineering of which sustainability is the main plank. What this means is that the notion of sustainable development must infuse the programme at all levels. This requires, in turn, a clear conception and a full understanding of what sustainable development is, to not only serve as a foundation for the programme, but also to be prescriptive, to a large degree of its content. The suggestion being put forward here is that the PSDF, as developed in this study, given its

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<sup>417</sup> Or, for that matter, it could apply to all engineering programmes.

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ethical foundation and broad ambit, can be this frame of reference for a programme in sustainability engineering.

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## CHAPTER 12

### EPILOGUE

#### 12.1 INTRODUCTION

This study stemmed from the frequently observed clash between development initiatives and environmental conservation, here characterised as the environmental dilemma. This environmental dilemma becomes particularly conspicuous in the case of infrastructural developments where the resultant environmental impact is very visible. In these instances the role played by engineers, mainly civil engineers, as the designers and constructors of these developments, comes under the spotlight, and not infrequently they are seen as “tools of the establishment” and “despoilers of the environment” (Vesilind & Gunn, 1998: 29). But, as comes to light in this study, the problem is deeper than this; in the final instance it involves the kinds of choices that society has to make.

This work commenced with a case study which illustrated, in practical terms, an instance where a proposed infrastructural development clashed with the environmental sensitivities of some concerned members of society. It also illustrated how engineers by doing what they do in such cases, are almost inevitably, cast in the role of being pro-development, and thus by implication anti-environment. Taking a step back from this particular example of the environmental dilemma, it was shown that the ambit of environmental concerns is becoming increasingly widespread. This is happening on two fronts; firstly these concerns are growing as a result of the increasing evidence of anthropogenic environmental degradation, and secondly, the interpretation of the concept of the *environment* has, over time, broadened from a focus restricted to the natural environment, to one which includes the social environment as well. Against this expanded conceptualisation of environmental problems, it was felt that if development activities were to be cleared of their apparent causative role in these problems, they would have to be restructured on the basis of a ‘new’ development model. This development model would need to meet a number of requirements; it would have to be:

- (a) widely accepted,
- (b) ethically justified, and
- (c) sufficiently foundational so as to motivate a societal paradigm change.

The model which immediately comes to mind is that of *sustainable development*. The reason which makes it an obvious choice, is its widespread popularity. In recent years it has risen to be a recognised goal in numerous national, company and organisational manifestos. It has been the topic of two world summits organised by the UN. And while it may have its detractors they have not managed to dent its popularity; it continues to be a mantra for politicians, CEOs, chairmen, and leaders of any description. And so, without much difficulty, it manages to meet the first of the requirements listed above. On the downside, the concept of sustainable development is undeniably vague. Its critics charge that it is precisely because of this vagueness, that all and sundry can read into the concept whatever they want, thereby emasculating the power that is perceived to reside in its popularity. Much of this study has therefore focussed on addressing this vagueness that appears to be so characteristic of the concept. In the process of doing this, the study has covered the requirements (b) and (c) listed above.

## **12.2 THE ETHICAL JUSTIFICATION FOR SUSTAINABLE DEVELOPMENT**

In its search for an ethical justification for sustainable development, this study has ventured into the fields of ethics and environmental ethics. Firstly some of the more enduring traditions in the field of philosophical ethics were discussed; these included the natural law tradition, utilitarianism, deontology, and virtue theory. Most of these traditional theories find application in some aspects of modern society, and also in the justification of some environmental priorities. For example the natural law tradition would insist that nature must be allowed to flourish to its fullest extent, as in so doing it meets its final purpose or ‘telos’. Utilitarianism seeks the maximum benefit for society, and that would include the wise use of natural resources. The human rights culture, and its extension, animal rights, are rooted in the deontological approach. In the environmental context virtue theory might make much of such human virtues as humility, respect for nature, and compassion for all living things. Notwithstanding such various applications of the traditional ethical theories, it appears that none can claim supremacy as *the* master narrative. It always seems to be possible to find a situation in which the application of the dictums of a particular theory leads to undesirable results. Problems also arise in trying to decide between competing ethical claims, where the answers provided by the different theories clash, or even when these claims fall within the ambit of the same theory, but the theory cannot provide a clearcut answer. Another ethical approach which seems to make some sense, particularly from an environmental point of view, is that of evolutionary ethics. As its point of departure it focuses on how ethical values

develop in society. It suggests that our most basic ethical values may be rooted in our evolutionary history, perhaps in a way not unconnected to the way in which humans have evolved the unique ability to moralise.

The study then moved on to the topic of environmental ethics, a branch of ethics that focusses on the relationship between human beings and the natural environment. If the field of ethics presented a diversity of opinions, then it seemed even more so to be the case with regard to environmental ethics. A number of bipolar themes were identified as being characteristic of the diversity of opinions in this field. The first, that of instrumental values versus intrinsic values, looks at the ways in which humans value nature. Those that see nature only as a resource, there for the benefit of humans, place an instrumental value upon nature, whereas those that argue for the intrinsic value of nature, feel that nature has value in and of itself, irrespective of what instrumental value it may hold for humans. Instrumental valuers accord value from an anthropocentric perspective; in other words they see nature through human eyes. This approach sees a clear divide between humans and nature, with the latter often viewed as an adversary that has to be subdued, or else simply as a wellspring of resources, and as a sink for human waste. On the other hand, those that see humans as part of nature, and not necessarily any more important than any other part of nature, can be said to view nature non-anthropocentrically, and accord it intrinsic value. Many environmentalists argue that the environmental problems that beset the world are rooted in the anthropocentric, instrumental view of nature.

Another bipolar theme that features widely in environmental ethical debate, is the issue of monism versus pluralism. A monist believes in a single master principle or set of related master principles, whereas a pluralist does not believe that such a principle or set of principles exist. Pluralists accept that there may be many valid ethical principles, and that the situation at hand may determine which to apply. Typically then a pluralist would argue that the values of any one culture are, on the whole, no better than the values of any other culture. In its extreme form pluralism results in a situation where *all* values are relative, and moral debate thus becomes of little consequence. In practice, however, it seems that most, if not all of us, live as though some values are more important than others. A pragmatist thus, while generally a pluralist in approach, recognises that some values may be better than others. He or she does not fall back on a master theory to prove this to be the case, and generally looks for what works best in practice. Pragmatism can be seen as a reasoned ethical response to the contestation evident between the various traditional ethical theories, or the bipolar debates

characteristic of the field of environmental ethics. In view of the urgency of many environmental problems, pragmatism recognises the need for action, and it is open to the idea that ethical insights may develop from practice.

Given this theoretical ethical diversity, this study, in trying to find an ethical justification for sustainable development, formulated an ethical model which, while recognising those basic ethical values that appear to be so widely accepted in society that they are considered to be rooted in our evolutionary history, also recognized that in many instances an ethical pragmatism could be the only way forward.

### **12.2.1 An ethical model for sustainable development**

It seems logical that if sustainable development is to be ethically justified, that this justification would have to be as readily and widely accepted as the concept of sustainable development itself. This is why one has to look beyond traditional ethical approaches, which all seem to have their fair share of adherents and detractors, to an approach that is even more basic than the said traditional approaches. It is felt that an ethic with its roots in our evolutionary history could potentially deliver on the universal acceptance sought for. With this thinking in the background an ethical model, consisting of five propositions, was developed to hopefully provide the ethical foundation for sustainable development. The propositions are as follows:

*A: The focus of the proposed ethical model is on the impact of human activities on the environment*

The proposition aims at being specific about the scope of the model. Of concern is the morality of human *actions*; human thoughts or inclinations are not primary components of the model. These actions are those that take place across the human/environment interface, and with the environment broadly interpreted, this includes elements of nature as well as human beings. To emphasise this inclusivity the term *others* was introduced; it is a term which is synonymous with the wider interpretation of the environment, but for descriptive purposes, more succinct and convenient. Furthermore, all human actions are deemed to consist of three components: the intention, the action itself and the outcome. The morality of a human action resides in its intention and its outcome; the action itself bears no moral value. And so this proposition may

more expansively be rephrased as follows: the scope of the ethical model is limited to the consideration of the morality of the intentions of human actions, and the outcomes of these actions, on others.

*B: Universal evolved moral intuitions inform our ethical thinking*

This proposition focusses on *how* we develop our morality. Traditional ethical theories arrive at their perception of the moral good through a process of reasoning, and yet while their arguments seem quite acceptable in many situations, there are also situations where their prescriptions produce seemingly immoral results. This points, it seems, to basic moral values, more fundamental than the traditional theories, but with which the theories are mostly in accord, although sometimes not. These basic moral values are, it seems, perceived intuitively, that is to say, without the benefit of in-depth moral reasoning and theoretical justification. It is concluded that not only is our ability to moralise an evolutionary product, but also that, at a very basic level, some of our moral values themselves have evolutionary roots. Hence, it is argued that our most basic moral instincts are near universal, notwithstanding the fact that they are sometimes heavily masked by cultural influences. If such basic moral instincts can be articulated, their universality must surely make of them an adequate ethical grounding for sustainable development.

*C: The fundamental good is beneficence*

Arguing from, *inter alia*, the ubiquitousness of the so-called Golden Rule, this proposition asserts that the altruism rooted in our evolutionary history has allowed *beneficence* to be intuitively recognised as *the* basic moral good. (Beneficence is understood as an active goodness and kindness extended towards others.) This intuition, it is argued, is near universal, which is to say that very few people, if any, would argue that beneficence is inherently immoral. In support of this proposition it may be argued that all of the traditional ethical theories are, in one way or another, attempting to give effect to the principle of beneficence, and where they are accused of breaking down, it is precisely because in these instances they fail to produce beneficence. The universal endorsement of beneficence suggests that it is the ideal ethical founding for sustainable development.

*D: Holism, fairness and moral distance inform the application of beneficence*

If the fundamental moral good resides in the according of beneficence to others, the question of who the others are, arises. The *principle of holism* applied to this question moves the boundary of moral worthiness beyond humans to include entities from the natural environment. It was argued here that all those who have intrinsic value should be considered morally worthy. Furthermore it is argued that it is the living who, because of the fact that they have inherent self-interest, have intrinsic value. The conclusion is that the boundary of moral worthiness should in principle include all the living; this is otherwise known as the biocentric principle. Beneficence therefore implies adding to the intrinsic value of the living by advancing whatever is of instrumental value to them. The differential apportionment of beneficence is effected through the *principle of fairness* (another fundamental, and close to universal value), aided by the notions of *respect* for, and *dueness* of, the recipients. Overlapping these notions is the idea of *moral distance*. The concept of moral distance (be it spatial, familial, temporal, generational, etc.) allows beneficence to be apportioned differentially in accordance with the moral proximity of the recipient.

*E: Pluralistic pragmatism moderates cultural norms and proclivities*

A concerted effort was made to identify values with such wide acceptance that it qualified them to serve as the foundation values of the proposed ethical model. Such values emerged from our evolutionary history. It is widely evident however that society has many other values that can be considered part of our cultural heritage, and which because of differences between cultures can come into conflict with each other. Because sustainable development addresses all of society (and more), these potential conflicts cannot be avoided when sustainability is pursued. This problem may also arise from the fact that sustainable development practice is essentially multi-disciplinary. The lack of an overriding ethical theory (apart from the basic values of beneficence, fairness, etc.) points to pluralism and pragmatism as the ways forward. So, despite the monistic elements of the proposed ethical model (the said basic values), it is also characterised by a strong inclination towards a *pluralistic pragmatism*.

## 12.3 SUSTAINABLE DEVELOPMENT

As has been said, the popularity of the concept of sustainable development, makes it an ideal strategy for addressing the ubiquitous problems of the environment (broadly defined). Its vagueness, and the difficulty in measuring it, however stand in the way, and point to the need for a more rigorous analysis of the concept. In this study this analysis of sustainable development started with an overview of the historical development of the concept which showed that it arose in conjunction with a developing desire for a new societal paradigm, or a new world-view. This new paradigm is deemed by many as a necessity if the environmental predicaments of our time are to be addressed successfully. Thus it comes about that sustainable development is seen as the practical realisation of the new paradigm.

The concept of sustainable development itself however seems to defy exact definition, or expressed differently, it is defined in a multitude of different ways. While of course many of the definitions overlap, it appears that any approach, based on a succinct definition of the concept, fails to cover the full sweep of sustainable development. Hence, in this study, it was felt that the depth and scope of sustainable development could be much better articulated through a *framework*, in which the characteristics of the concept are described via a number of descriptors, not unlike those used in the process of strategic planning. The descriptors included in the framework being proposed in this study are essentially those of *vision, values, principles, and dimensions*.

### 12.3.1 Proposed framework for sustainable development (PSDF)

The first (and highest) level of descriptor in the proposed framework is designated as vision. If sustainable development is seen as a journey away from our present unsustainable ways of living, to a state of sustainability, then it is not difficult to accept that the vision of sustainable development must be *a sustainable society*. In this study a sustainable society is defined as follows:

*A sustainable society is one that maximises the well-being of its members while they live in harmony with their environment.*

The values of sustainable development are found at the next level of the framework, and they have already been fully articulated and substantiated in the proposed ethical model for

sustainable development. In the framework they are expressed as follows:

- *reverence for life*
- *beneficence*
- *fairness.*

At the next level of the framework are the so-called foundational principles. They are:

- *the respect for life principle*
- *the holism principle*
- *the sustainability principle.*

The respect for life principle is none other than the biocentric principle, and while it may appear to be a repetition of the reverence for life value, found at the previous level of the framework, at this level it is seen as a modifier for the holism principle. The holism principle requires *inter alia* that all should receive moral consideration, but the respect for life principle modifies this requirement to those who are the subject of a life.

The need for the last of the foundational principles, the sustainability principle, became apparent after the next step in the development of the framework was completed. This step was based on an extensive literature research aimed at uncovering the principles most widely associated with sustainable development, the assumption being that these principles would be the most authoritative. While many different sets of principles were found in the literature, only thirteen of these were selected for the final review. In the selection process an attempt was made to include sets of principles the sources of which could be placed in a number of disparate categories. In each category three or four sets of principles were selected for review. In this way it was hoped to mask the possible bias in individual sets of principles, and also the bias that may be characteristic of the principles from a particular category. The four source categories employed in this study were those:

- *with an inclination towards the natural environment*
- *from a social/economics background*
- *with a national orientation*
- *from international conferences.*

In the course of reviewing the various sets of principles it became clear that most of the sets, some more explicitly than others, supported the breakdown of sustainable development into what are here called dimensions, and that most of the principles could be categorised under one of these dimensions. A three-dimensional breakdown appeared to be the most popular in the literature, but on reasoned grounds it was decided to employ a less common, four-dimensional breakdown in this study.<sup>418</sup> These four dimensions are:

- the *environmental* (here narrowly conceived as pertaining to the natural environment),
- the *social*,
- the *economic*, and
- the *institutional*.

For each of the dimensions a dimensional goal was formulated, these being respectively *environmental integrity*, *social cohesion*, *economic vitality* and *capacitation*. The sustainability principle, referred to here above, not only confirms this dimensional breakdown of sustainable development, but it also clearly articulates the need for integration to take place between the various dimensions.

From the review of the sets of principles a ‘master’ set was derived consisting of eighteen principles. In order to distinguish them from the foundational principles they were named subsidiary principles, and were arranged in dimensional categories at the next level of the framework. These principles are shown in Table 12.1.

TABLE 12.1: SUBSIDIARY PRINCIPLES IN THE PSDF<sup>419</sup>

<b>Environmental Dimension</b>	<b>Social Dimension</b>	<b>Economic Dimension</b>	<b>Institutional Dimension</b>
Carrying capacity Conservation Precautionary Minimum impact Anti-cruelty	Fairness Human dignity Participation Empowerment Responsibility	Efficiency Sufficiency User pays	Democracy Effective governance Corporate responsibility Global Practicality

<sup>418</sup> Appropriately this four dimensional breakdown of sustainable development is also advocated in the South African *National Strategy for Sustainable Development and Action Plan* (South Africa, 2011).

<sup>419</sup> A full description of these principles is to be found in Appendix C16.

Two important characteristics of the proposed framework have to be noted. Firstly the framework is so designed that the entries at the higher levels of the framework can be construed monistically, while those at the lower levels may be interpreted more pluralistically. This means that the upper levels of the framework are prescriptive, while the lower levels are less so, and still in the process of developing. While the concepts of strong and weak sustainability usually refer, in a more technical sense, to the ease with which resources in the environmental dimension can be substituted by resources from the other dimensions, these concepts can also be used, in a looser sense, to refer to a comprehensive application of the principles of sustainable development (strong sustainability), as opposed to a more selective (particularly at the lower levels of the framework) application of the principles (weak sustainability).

The second characteristic of the proposed framework deals with the dimensionalised structure of the lower levels of the framework. These dimensional categories are useful for understanding the concept of sustainable development; they are not individually of critical importance, but their integration is (the sustainability principle). The dimensional categorisation employed in the framework is more a matter of convenience than of principle. The dimensional categories are not absolute or mutually exclusive.

Proceeding to the lower, and more tentative levels of the framework, the next level deals with the *measurement* of sustainable development. Due to the fact that the full import of sustainable development is still evolving, its measurement has by no means reached the stage of fixed, standard procedures. More often, the measurement of sustainability reflects a particular understanding of the concept, or procedures typical of a particular discipline. In the measurement process indicators are employed, and the quantitative or qualitative values that these indicators acquire in the measurement process, is indicative of the level of sustainability of an activity. While indicators are quite specific, the respective arenas in which they are operative, are more generic. It is thought that at this stage of the development of the proposed framework it would be adequate and practical to only list these arenas, or themes as they are called here, in the framework.

The last level of the framework, as it was developed here, is also the level closest to what may

be called sustainability practice. It contains methodologies or applications that are designed to promote sustainability. Given the wide scope of the notion of sustainable development there are obviously numerous diverse applications that attempt to operationalise it, some more effectively so than others. A few of the better known applications are included in the framework, but more in the spirit of being examples rather than being prescriptive methodologies.

The PSDF is outlined in Appendix F.<sup>420</sup>

## **12.4 SUSTAINABLE DEVELOPMENT IN SOUTH AFRICA**

Having developed a deeper and broader understanding of the concept of sustainable development through the PSDF, the study then proceeded to look at how this concept has found expression in South Africa. Firstly the South African legal and policy framework around sustainable development was reviewed, and secondly two case studies involving real development activities in the country were explored.

### **12.4.1 Environmental law**

It needs to be noted that in the legal setting the term ‘environment’ is mostly used in the more narrow context of the natural environment, and that sustainability in this context is often conflated with environmental issues. Hence in investigating the legislative position of sustainability in South Africa the focus fell on environmental law. It was established that while South Africa has many pieces of environmental legislation, it is two senior laws that are of the most relevance to this study; they are the *Constitution of the Republic of South Africa* (Act 108 of 1996) and the *National Environmental Management Act* (Act 107 of 1998) (NEMA). Not only was an environmental right included in the Bill of Rights of the SA Constitution, it was

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<sup>420</sup> The PSDF does not pretend to be the final word on sustainable development. Indeed, as sustainable development is in some ways still an evolving concept, so one can expect the PSDF to reflect this evolutionary flux. Also there still remains the need to develop a robust protocol for the implementation of the PSDF in practice, particularly where, for example, the simultaneous application of two or more principles may lead to clashing actions.

also expressed in terms that unmistakably endorsed the notion of sustainable development. NEMA can be regarded as the parent environmental law of South Africa, and while laws formulated under its ‘auspices’ usually deal with specific environmental issues, NEMA itself is of a more general nature. In this context it posits 21 principles (see Appendix C10) that can be regarded (together with the above mentioned part of the SA Constitution) as the most authoritative statement (legally speaking) on sustainable development in the country. While sustainable development is then clearly legitimated in South African law, one may still perhaps criticise its explicit anthropocentric bias. As the PSDF pointedly tries to avoid such a bias, and as all the NEMA principles were under consideration in the formulation of the PSDF principles, one may conclude that the PSDF not only adequately covers the legal requirements for sustainable development in South Africa, but also that it does so with less anthropocentric bias.

#### **12.4.2 Sustainable development policy in South Africa**

The sustainable development policy situation in South Africa was investigated, in the main, through two Government publications: the *National Strategy for Sustainable Development and Action Plan* (NSSD1), and its precursor the *National Framework for Sustainable Development* (NFSD). In both these documents the general tenor was more bold than that of NEMA. While maybe still not committing to an explicit intrinsic valuation of nature, the NSSD1 does recognise that “the maintenance of healthy ecosystems and natural resources are *preconditions* for human wellbeing” (South Africa, 2011: 8; [emphasis added] ). Also on the positive side was the degree of corroboration that could be found between the NSSD1 and the NFSD on the one hand, and the PSDF on the other hand. This was evident in at least four areas of similarity:

- in their vision for sustainable development
- in their four-dimensional categorisation of sustainable development, and in the hierarchy given to these dimensions, and also in the supportive role assigned to the institutional dimension
- in the principles of sustainable development they include, and in the hierarchical structure of the principles
- in the hierarchy of descriptors that they employ.

Thus, while the formulation of a sustainable development strategy and sustainable development

plans are considered to be beyond the envisaged scope of this study, it was nevertheless shown that the PSDF could readily be extended to meet such requirements.

An area that emerged somewhat problematical from the NFSD/NSSD1 investigation, is the deferential role assigned to sustainable development *vis-à-vis* other governmental policies. This is reflected in the fact that sustainable development is not recognised as *the* government policy, as maybe the *National Development Plan* (NDP) is, nor does it have the benefit of a Ministry within the Presidency as is the case with the NDP. The inevitable impression one gains, is that sustainable development is but one of a number of governmental initiatives, and that as such it is subject to constraints which may be implicit or explicit in the other, more senior, policies. In contrast, the way in which sustainable development is viewed in this study, and also as it is intended to be understood in the PSDF, is that sustainability should be seen as *the* senior policy objective of the government, and that indeed all other policies should be accommodated under its ambit. This corresponds to the idea of sustainability being representative of a new world-view.

A general conclusion reached after reviewing both the legal and policy status of sustainable development in South Africa, is that these are generally of a high standard, some interpretative problems notwithstanding. A more real problem lies in the tardy implementation of the relevant legislation and policy prescriptions in practice. Thus it was appropriate, in the next step of this study, to look more closely at sustainable development in practice by working through two South African case studies.

#### **12.4.3 Golfing estate developments in the Southern Cape**

The problem with golfing estate developments, particularly in the Garden Route region of the Southern Cape, lies mainly in the increasing number of these developments, in the demands they make on the natural resources of the region, such as water and land, and in the perception that they are pockets of wealth and privilege surrounded by communities which are largely poor and disadvantaged. These problems are said to put the natural beauty of the region, its attraction in the first place, in danger, while also exacerbating the social problems of the area. However the golfing protagonists paint a different, and far more positive, picture of these developments.

The environmental dilemma, defined in this study as the clash between development activities and environmental concerns, is clearly manifested in the golfing estate developments taking place in the Garden Route. The intractability of this dilemma emerges in the many arguments made for, and against, these developments. For example the golfing estate developments are said to bring employment to the region, and to reinforce the local economy. In addition, many of the developers have promised to deliver specific social development projects, aimed in particular at the poor communities that surround these developments. On the other hand, apart from the already mentioned problems of these developments, they also are said to bring about increased social tension in the region, as was evidenced in marches, demonstrations, petitions and court cases that took place.

Being employed by the developers to oversee the physical establishment of these developments, engineers are inevitably involved in the controversies around them. But in this case study the focus is a bit broader, on the choices that society has to make. There do not appear to be any clearcut answers. However it is the theme of this study that for dilemmas like this, the solution lies in the direction of sustainable development. But with sustainable development being a contestable subject itself, the answers are still not always unequivocally clear. However the need for a sound guideline seems obvious. In this regard this study is promoting the PSDF in general, and for engineers in particular, the proposed Sustainability Charter. As for a practical response, the need, in this case, for pro-active planning on a regional level, has been clearly demonstrated, and that points to a regional strategic environmental assessment, an application within the fold of sustainable development.

#### **12.4.4 The Wild Coast Toll Road (WCTR)**

In the unfolding of this development the role played by engineers was much more prominent than in the previous case study. They were primarily cast in the role of the principal developers, initially as a development consortium and in the later stages as SANRAL, the national road developing agency of South Africa. And in this role they were pitted directly against the opponents of this development, which included environmental NGOs, sections of the community, church groups, businesses, and even governmental bodies.

The “essence” of this development is the proposed construction of a tolled highway from Durban to East London, through (controversially) the Wild Coast region. The Wild Coast is an area of great natural beauty and also of unique botanical richness. At the same time the communities of this region are greatly neglected in terms of development. Much of the argument around this development revolves around the suitability or not of a toll road (particularly in this area) as an instrument of development. That development is needed in the Wild Coast region is not at issue, but the question is, can a limited access tolled highway effectively fulfil this need, particularly if, as is being contended, it renders significant damage to the botanical worth and natural beauty of the area, characteristics which in their own right could be the cornerstones of the eco-development of the area. The toll road is obviously intended to serve large business interests located at its extremities, but the mooted mining of heavy minerals in the Wild Coast region is not only an additional beneficiary, but also a source of great environmental concern, and for some, makes the motivation for the road even more suspect. As usual the proponents of the WCTR make much of the employment that the road (and mining) can bring to the region, while the opponents argue that this employment is largely of a temporary nature, and that the development compromises the more long term employment opportunities offered by eco-tourism.

It cannot be said that the engineers have enhanced their reputation with respect to environmental and sustainability issues in this saga. Accusations of intimidation and corruption made against the developers, reflect back negatively on the engineers involved in the development. The fact that the first authorised approval of this development was subsequently revoked on the grounds of an irregularity that had previously been pointed out, may be indicative of their dismissive attitude. Their heavy reliance on technical and economic arguments in preference to more holistic considerations may be another issue of concern. If engineers wish to be seen as leaders in the field of sustainable development, their commitment to win-win solutions will have to be more explicit than was the case in the WCTR saga. What seems evident in this case study, is that notwithstanding the current environmental legislation and sustainability policies, the engineering practice was not, in any essential sense, based on sustainable development.

## **12.5 SUSTAINABLE DEVELOPMENT AND ENGINEERING IN SOUTH AFRICA**

Having, particularly in the last case study, reflected critically on the relationship between (civil) engineering practice in South Africa and sustainability, and having found this relationship somewhat inadequate, the next step was to see how improvement can be brought about. In this study two approaches are suggested; firstly the focus is on how engineering practice may benefit from a sustainability code of conduct for engineers, and secondly attention is turned to the education of civil engineers in South Africa to see what could be done to inculcate the attitude, skills and knowledge of sustainability in graduating engineers.

### **12.5.1 A sustainability code of conduct for engineers**

From abundant evidence (including the above case studies) it is clear that engineering practice, more often than not, impacts extensively on the environment. Engineers are not blind to this fact, as is confirmed by the number of initiatives towards sustainability that have sprung from their ranks. The Sherbrook principles (§7.1.6) and the Cambridge model (§10.1) are two such examples, to both of which the PSDF has been compared and not found wanting. Possibly because of this intimate relationship between engineering practice and environmental integrity, a number of engineering bodies have suggested that engineers should play a leadership role in sustainable development. If this suggestion is to be realised there are at least two quite fundamental problem areas that need to be considered. The first deals with the fact that engineers are trained, and operate in the traditional scientific paradigm; this means that their education and practice leans towards positivist, reductionist solutions, which they largely see as value-free. The second problem is the close association between their practice and the Western, consumerist outlook, which also implies belief in economic growth as the solution to many of humanity's problems. At the risk of oversimplification the potential engineering responses to these problems can be concentrated at one of two levels. At the first level sustainability is seen as an additional body of knowledge and set of skills that engineers need to master. This approach does not imply any major change to the traditional engineering philosophy. This approach, a superficial 'greening' of engineering training and practice, may be characterised as weak sustainability. At the second level there is a more fundamental re-orientation, which some may see as the assumption of a new world-view. In essence it implies

the adoption of sustainability as a main, if not *the* main plank of engineering. This approach may be characterised as strong sustainability.

With this background of the relationship between engineering and sustainable development, several engineering codes of conduct<sup>421</sup> from across the world were reviewed in an attempt to gauge their engagement in terms of depth and scope with the notion of sustainable development. It was found that the level of engagement ranged from minimal (in the form of a sentence or two added to an existing code of conduct) to extensive (such as a separate code on the topic in its own right). A not unexpected general trend that emerged from the review was that the earlier codes employed, what can be called an ‘environmental’ phraseology, and only in the later codes did it turn more towards ‘sustainability’. Associated with this trend was a noticeable tendency in some of the earlier codes to be more bold in terms of environmental/sustainability prescriptions, and to be less so in the later codes or the later revisions of codes. It was as if the wider ambit of ‘sustainability’, as it evolved from the earlier ‘environmental’, had an inhibiting effect.

The codes of a few international engineering organisations, as well as the codes produced by national engineering bodies in the USA, the UK, Australia, New Zealand and Sub-Saharan Africa were included in the review.<sup>422</sup> As is to be expected, variable levels of engineering commitment to sustainability emerged in the review, but the codes from the organised engineering community in the UK were of a particularly high standard. The UK sustainability statements, and where applicable, also others that were part of the review, were pointedly compared to the PSDF, and apart from a few non-fundamental (from a sustainability perspective) aspects that related mainly to the relationships between engineers themselves, and between engineers and their clients, the PSDF was found to be adequately representative of all the sustainability ideals or duties reflected in the reviewed codes. This finding together with the fact that the sustainability commitments from South African engineering sources were quite modest, prompted the formulation in this study, of a *Sustainability Charter for Engineers* (see

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<sup>421</sup> The phrase ‘codes of conduct’ is used somewhat loosely here to include codes of ethics or practice, or charters, or others types of documents reflecting engineering commitments to sustainability.

<sup>422</sup> While the review focussed in general on documents of civil engineering origin, this was by no means an exclusive rule. The level of civil engineering commitment to sustainability did not in any case appear to be significantly less than was the case for the other engineering discipline.

Appendix N). This charter, intended for South African (civil) engineers, is largely based on the PSDF, and it is contended here that if the charter is fully adhered to, it should lead to the realisation of strong sustainability in local engineering practice. It also follows that the Engineering Council of South Africa (ECSA), the body responsible for the registration of engineers in South Africa, will at the same time, have to be prepared to accept that sustainability can be a fundamental tenet of engineering, even if it leads to the recognition of the new discipline of sustainability engineering in South Africa.

### **12.5.2 Sustainability engineering education**

If it is the ideal that engineers should be professionally committed to sustainability, it follows that their education and training will have to undergird this commitment. Again it will be possible to distinguish between educational programmes for engineers that translate into weak sustainability and those that can lead to strong sustainability. The likelihood is small that all engineering educational programmes will, in the short term, undergo such radical transformations as may be implied by strong sustainability. It is more likely that most programmes will reflect modest modifications, such as one or two ‘sustainability’ or ‘environmental’ offerings being added to existing curricula, and such modified programmes can, at best, promote weak sustainability. Strong sustainability would require a comprehensive programme remodelling such that sustainability runs, like a thread, through most if not all offerings, from the first year level right through to the final year. While in the first type of programme sustainability is treated as an ‘add-on’, in the second type of programme sustainability is a main theme around which the educational curriculum is designed. In this study these latter types of programmes are referred to as educational programmes in *sustainability engineering* and their graduates as *sustainability engineers*.

In a review of educational programmes in civil engineering in South Africa, it appeared, given the above explanation, that they would not be able to deliver much more than weak sustainability. It should not be inferred from the foregoing though that ‘weak sustainability’ engineering programmes are, under the current circumstances, undesirable; any education towards sustainability is better than none. Indeed, it is argued, that all engineering educational programmes should support, at least, weak sustainability. In the foreseeable future however,

there is also the need, in South Africa, for engineering programmes that are modelled on strong sustainability, that is to say, programmes that will carry the label and ethos of sustainability engineering. There are, in the current situation, a number of challenges that have to be met, or inhibiting factors to overcome in order to introduce authentic sustainability engineering programmes in South Africa; they are as follows:

#### *Foundational issues*

At its heart an educational programme for sustainability engineering will need a strong and comprehensive statement of what sustainability is about. It is suggested here that the PSDF can be this point of reference; it has the vision, the values and the foundational principles that can undergird such a programme. The holism principle in itself sets certain challenges for a sustainability engineering programme. From a theoretical perspective it implies that complexity theory should be an essential part of the programme. It also puts into question the idea of specialisation, if this implies a return to reductionism. Instead there is a “need to *specialise* in generality and complexity” (Elms, 1995a: 4).

#### *Academic issues*

From a practical perspective the holism principle points to (using Ashford’s nomenclature (Ashford, 2004)) not only multi-disciplinary approaches (exposure to many disciplines), but more importantly also to trans-disciplinary approaches (integration across disciplines). In this study multi-disciplinary offerings have been linked to weak sustainability, and trans-disciplinary offerings to strong sustainability.

While detailed comment around the curriculum of an educational programme in sustainability engineering is considered outside the scope of this study, some tentative proposals in this regard, bolstered by examples of the curricula of existing (overseas) programmes close to this type, are made (see §11.4). Once again the PSDF is held up as a point of reference for much of what could be included in the curriculum of such a programme.

#### *External issues*

It seems that the special nature of a programme in sustainability engineering predicates lecturers that not only possess sustainability knowledge and skills, but also the belief in and passion for

sustainability as an ideal. From an institutional point of view, the multi-disciplinary<sup>423</sup> nature of a programme in sustainability engineering poses problems in terms of scheduling, funding and departmental location. All of this points to the need for understanding and support at the top management level of the institution. Would this be possible if the institution itself is not, in terms of its ethos and operation, committed to sustainability? A review of the visions and strategic plans of a number of South African universities gave no conclusive proof of such a commitment currently, at least not at a foundational level.

Professional recognition of an educational programme in sustainability engineering will require that it be accredited by ECSA. Once again it seems that the distinctive nature of the programme would warrant special consideration, including amendments to ECSA's standards and procedures, particularly if it is accepted that the point of departure of sustainability engineering is different to that of the other engineering disciplines.

## 12.6 CONCLUSION

As a final conclusion to this study it now remains to succinctly sum up its main outcomes. They are:

- an ethical model on which sustainable development can be founded
- a framework that outlines the full depth and scope of sustainable development in terms of *inter alia*, vision, values, principles and dimensions
- a sustainability charter for engineers
- suggestions and caveats around the establishment of a BEng/BSc educational programme in sustainability engineering.

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<sup>423</sup> Here ignoring Ashford's terminology for the moment.

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# **APPENDICES**

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**APPENDIX A**  
**THREE APPROACHES TO ENVIRONMENTAL ETHICS**

(Merchant, 1990: 68)

	<b>EGOCENTRISM</b>	<b>HOMOCENTRISM</b>	<b>ECOCENTRISM</b>
<b>Fundamental grounding:</b>	– Grounded in the self (social atoms)	– Grounded in society	– Grounded in the cosmos
<b>Fundamental good:</b>	– Individual good prior to social good	– Social good	– All things have intrinsic value
<b>Overarching principle:</b>	– Profit / competition	– Utility	– Holism
<b>Subsidiary principles:</b>	<ul style="list-style-type: none"> <li>– What is good for individual will benefit society.</li> <li>– Limited only by effects on others</li> </ul>	<ul style="list-style-type: none"> <li>– The greatest good for greatest number</li> <li>– Interest of community is sum of interest of individuals</li> <li>– Actions good if they augment happiness of community</li> </ul>	<ul style="list-style-type: none"> <li>– Whole &gt; sum of parts</li> <li>– Meaning is context dependant</li> <li>– Process has primacy over parts</li> <li>– Human and non-human nature are one</li> </ul>
<b>Historical roots:</b>	<ul style="list-style-type: none"> <li>– Hobbes - humans competitive</li> <li>– Commons are fought over</li> <li>– Social contract to end violent chaos</li> <li>– Hardin - tragedy of the commons</li> <li>– Lifeboat ethics - triage</li> </ul>	<ul style="list-style-type: none"> <li>– Bentham/Mill - utilitarianism</li> <li>– Moral feelings overcome selfish motives</li> <li>– Acquired through education and civilisation advances</li> <li>– Golden rule</li> <li>– Sequential development of ethics</li> </ul>	<ul style="list-style-type: none"> <li>– Leopold - land ethic</li> <li>– Man citizen of land community</li> <li>– Sequential ethical development</li> <li>– Deep ecology</li> </ul>
<b>Socio-political context:</b>	<ul style="list-style-type: none"> <li>– Liberalism and laissez faire capitalism</li> <li>– Entrepreneurs and corporations in free market system</li> </ul>	<ul style="list-style-type: none"> <li>– Socialism</li> <li>– Central control and agencies</li> </ul>	<ul style="list-style-type: none"> <li>– Communalism</li> <li>– Small scale - back to land</li> <li>– Green politics</li> <li>– Redistribution</li> <li>– Bioregionalism</li> </ul>
<b>Environmental implications:</b>	<ul style="list-style-type: none"> <li>– Use natural resources to enhance own lives</li> <li>– Limited only by the effects on others</li> </ul>	<ul style="list-style-type: none"> <li>– Used for greatest good of greatest number of people for longest time</li> <li>– Centralized management</li> <li>– Extending lives of renewable resources and conserving non-renewable resources</li> </ul>	<ul style="list-style-type: none"> <li>– Sustainability</li> <li>– Social justice</li> <li>– Limits to growth</li> <li>– Preservation of ecosystems</li> </ul>

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	<b>EGOCENTRISM</b>	<b>HOMOCENTRISM</b>	<b>ECOCENTRISM</b>
<b>Religious roots:</b>	<ul style="list-style-type: none"> <li>- Dominion. Gen 1:28</li> <li>- Domination of nature</li> <li>- Salvation through good life</li> <li>- Colonialism/Racism legitimated</li> </ul>	<ul style="list-style-type: none"> <li>- Stewardship. Matt 25:24; Luke 16:2</li> <li>- Stewards, caretakers of nature</li> <li>- Management of nature for human benefit</li> </ul>	<ul style="list-style-type: none"> <li>- Pantheism</li> <li>- Process is fundamental</li> <li>- Nature treated with reverence</li> <li>- Each has intrinsic value</li> </ul>
<b>Scientific roots:</b>	<ul style="list-style-type: none"> <li>- Mechanistic - atomistic</li> <li>- Whole = sum of parts</li> <li>- External causes on inert parts</li> <li>- Change = rearrangement of parts</li> <li>- Dualistic model</li> </ul>	<ul style="list-style-type: none"> <li>- Still mechanistic</li> <li>- Use of thermodynamics, hydrology, electricity etc, for efficient management of natural resources</li> <li>- Interrelationships emerging (organic metaphor)</li> </ul>	<ul style="list-style-type: none"> <li>- Ecology and ecosystems</li> <li>- Land as a collective organism</li> <li>- Balance and harmony</li> <li>- Systems theory</li> </ul>
<b>Examples:</b>	<ul style="list-style-type: none"> <li>- Exploiting natural resources for individual benefit</li> <li>- Importing/exporting hazardous waste</li> <li>- Mining in reserves (e.g. St. Lucia)</li> <li>- Industry in sensitive areas (e.g. Saldanha Steel)</li> </ul>	<ul style="list-style-type: none"> <li>- Building dams, power plants etc. legitimated in utilitarian terms</li> <li>- Interbasin water transfers</li> </ul>	<ul style="list-style-type: none"> <li>- Saving nature for its own sake</li> <li>- Restoration ecology</li> <li>- Biological pest control</li> <li>- Opposition to animal experimentation</li> </ul>
<b>Strong points:</b>	<ul style="list-style-type: none"> <li>- Recognises ego as strong drive/realistic</li> </ul>	<ul style="list-style-type: none"> <li>- Brings interest of society to fore</li> </ul>	<ul style="list-style-type: none"> <li>- Conserves nature</li> </ul>
<b>Problems:</b>	<ul style="list-style-type: none"> <li>- Disregards collective behaviour</li> <li>- Ecological effects external to human economics</li> </ul>	<ul style="list-style-type: none"> <li>- Fundamentally anthropocentric</li> <li>- Failure to internalise ecological externalities</li> </ul>	<ul style="list-style-type: none"> <li>- Justification of intrinsic value accorded to non-human entities</li> <li>- Naturalistic fallacy - values derived from fact?</li> <li>- Advancement of society = evolution of ethics</li> </ul>

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## APPENDIX B DEFINITIONS OF SUSTAINABLE DEVELOPMENT

Mawhinney (2002: 3-5) has extracted a number of definitions of sustainable development from different sources and these form the basis of the list given here below, which is arranged according to some different orientations:

### What is sustainable development?

- 1 *Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. (Brundtland)*
- 2 *Sustainable development is economic and social development that meets the needs of the current generation without undermining the ability of future generations to meet their own needs. (National Strategies for Sustainable Development)*
- 3 *Sustainable development means improving the quality of life while living within the carrying capacity of supporting ecosystems. (World Wildlife Fund - IUCN)*
- 4 *Sustainable development delivers basic environmental, social and economic services to all residents of a community without threatening the viability of the natural, built and social systems upon which the delivery of these services depends. (International Council for Local Environmental Initiatives- ICLEI)*
- 5 *Sustainable development is reducing current levels of consumption of energy and resources and production of waste in order not to damage the natural systems which future generations will rely on to provide them with resources, absorb their waste and provide safe and healthy living conditions. (Local Government Management Board, UK - LGMB)*
- 6 *Social progress that recognises the needs of everyone*
  - *Effective protection of the environment*
  - *Prudent use of natural resources*
  - *Maintenance of high and stable level of economic growth and employment.**(UK Department of Environment, Transport and Regions)*
- 7 *Sustainable development is a strategy by which communities seek economic development approaches that also benefit the local environment and quality of life. It has become an important guide to many communities that have discovered that traditional approaches to planning and development are creating, rather than solving, societal and environmental problems. (US Department of Energy)*
- 8 *Sustainability should include:*
  - *all rounded development, economic, social, cultural and political*
  - *equal rights for all with the best quality of life to each and every person*
  - *reject social, economic and political exclusion*
  - *control pollution and minimize waste*
  - *pleasure of city life, dismissing the "back to nature" dream.**(Schoonbrodt)*

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- 9 *Sustainable development involves programmes in the developing countries that directly contribute to an improvement in the quality of life of the poorest people. (Novartis Foundation for Sustainable Development)*
- 10 *Sustainable development is the need for humanity to live equitably within the means of nature. (Wackernagel and Rees)*
- 11 *A compass for sustainable development:*
  - *Does an action cause a decrease on use of metals, fuels and minerals?*
  - *Does an action increase dependence on unnatural substances?*
  - *Does an activity encroach on productive parts of nature?*
  - *Does an activity result in use of unnecessarily large amounts of resources?**(Robert, et al.)*
- 12 *Sustainable development means that conditions necessary for equal access to the resource base be met for each generation. (Pearce, et al.)*
- 13 *Sustainable development will be non-declining per capita utility - because of its self-evident appeal as a criterion for intergenerational equity. (World Bank - Pezzey)*

A definition with a stronger focus on the traditional three dimensions of sustainable development is the one proposed by Dominski, *et al*:

- 14 *Sustainability may be defined as a dynamic balance among three mutually interdependent elements:*
  - *protection and enhancement of natural ecosystems and resources;*
  - *economic productivity; and*
  - *provision of social infrastructure such as jobs, housing, education, medical care and cultural opportunities. (Quoted in Bell & Morse, 2008: 79)*

### **What is sustainable business practice?**

- 15 *Sustainable business practice requires business leadership as a catalyst for change toward sustainable development, and to promote the role of eco-efficiency, innovation, and corporate social responsibility toward sustainable development. (World Business Council for Sustainable Development)*

### **What is a sustainable city?**

- 16 *A sustainable city is organised so as to enable its citizens to meet their own needs and to enhance their well-being without damaging the natural world or endangering the living conditions of other people, now or in the future. (Girardet)*

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**APPENDIX C1**  
**THE *CARING FOR THE EARTH* PRINCIPLES<sup>1</sup>**

(Extracted from IUCN, UNEP & WWF, 1991):

**Preamble:**

The holistic principle

**Ethical foundation:**

1. Respect and care for the community of life

**Essential criteria for sustainable development:**

2. Improve the quality of human life
3. Conserve the earth's vitality and diversity
4. Minimize the depletion of non-renewable resources
5. Keep within the earth's carrying capacity

**Approaches to be followed on the individual, local, national and international levels:**

6. Change personal attitudes and practices
7. Enable communities to care for their own environments
8. Provide a national framework for integrating development and conservation
9. Create a global alliance

NOTE: Numbers added for ease of discussion.

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<sup>1</sup> A fuller exposition of these principles is given in the main text.

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**APPENDIX C2**  
***THE EARTH CHARTER PRINCIPLES***  
(Earth Charter, 1999; Lubbers & Morales, 2001: 1921 - 1922.)

## **PREAMBLE**

We stand at a critical moment in Earth's history, a time when humanity must choose its future. As the world becomes increasingly interdependent and fragile, the future at once holds great peril and great promise. To move forward we must recognize that in the midst of a magnificent diversity of cultures and life forms we are one human family and one Earth community with a common destiny. We must join together to bring forth a sustainable global society founded on respect for nature, universal human rights, economic justice, and a culture of peace. Towards this end, it is imperative that we, the peoples of Earth, declare our responsibility to one another, to the greater community of life, and to future generations.

### **Earth, Our Home**

Humanity is part of a vast evolving universe. Earth, our home, is alive with a unique community of life. The forces of nature make existence a demanding and uncertain adventure, but Earth has provided the conditions essential to life's evolution. The resilience of the community of life and the well-being of humanity depend upon preserving a healthy biosphere with all its ecological systems, a rich variety of plants and animals, fertile soils, pure waters, and clean air. The global environment with its finite resources is a common concern of all peoples. The protection of Earth's vitality, diversity, and beauty is a sacred trust.

### **The Global Situation**

The dominant patterns of production and consumption are causing environmental devastation, the depletion of resources, and a massive extinction of species. Communities are being undermined. The benefits of development are not shared equitably and the gap between rich and poor is widening. Injustice, poverty, ignorance, and violent conflict are widespread and the cause of great suffering. An unprecedented rise in human population has overburdened ecological and social systems. The foundations of global security are threatened. These trends are perilous—but not inevitable.

### **The Challenges Ahead**

The choice is ours: form a global partnership to care for Earth and one another or risk the destruction of ourselves and the diversity of life. Fundamental changes are needed in our values, institutions, and ways of living. We must realize that when basic needs have been met, human development is primarily about being more, not having more. We have the knowledge and technology to provide for all and to reduce our impacts on the environment. The emergence of a global civil society is creating new opportunities to build a democratic and humane world. Our environmental, economic, political, social, and spiritual challenges are interconnected, and together we can forge inclusive solutions.

### **Universal Responsibility**

To realize these aspirations, we must decide to live with a sense of universal responsibility, identifying ourselves with the whole Earth community as well as our local communities. We are at once citizens of different nations and of one world in which the local and global are linked. Everyone shares responsibility for the present and future well-being of the human family and the larger living world. The spirit of human solidarity and kinship with all life is strengthened when we live with reverence for the mystery of being, gratitude for the gift of life, and humility regarding the human place in nature. We urgently need a shared vision of basic values to provide an ethical foundation for the emerging world community. Therefore, together in hope we affirm the following interdependent principles for a sustainable way of life as a common standard by which the conduct of all individuals, organizations, businesses, governments, and transnational institutions is to be guided and assessed.

## **PRINCIPLES**

### **I. RESPECT AND CARE FOR THE COMMUNITY OF LIFE**

#### **1. Respect Earth and life in all its diversity.**

- a. Recognize that all beings are interdependent and every form of life has value regardless of its worth to human beings.
- b. Affirm faith in the inherent dignity of all human beings and in the intellectual, artistic, ethical, and spiritual potential

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of humanity.

**2. Care for the community of life with understanding, compassion, and love.**

- a. Accept that with the right to own, manage, and use natural resources comes the duty to prevent environmental harm and to protect the rights of people.
- b. Affirm that with increased freedom, knowledge, and power comes increased responsibility to promote the common good.

**3. Build democratic societies that are just, participatory, sustainable, and peaceful.**

- a. Ensure that communities at all levels guarantee human rights and fundamental freedoms and provide everyone an opportunity to realize his or her full potential.
- b. Promote social and economic justice, enabling all to achieve a secure and meaningful livelihood that is ecologically responsible.

**4. Secure Earth's bounty and beauty for present and future generations.**

- a. Recognize that the freedom of action of each generation is qualified by the needs of future generations.
- b. Transmit to future generations values, traditions, and institutions that support the long-term flourishing of Earth's human and ecological communities.

In order to fulfill these four broad commitments, it is necessary to:

**II. ECOLOGICAL INTEGRITY**

**5. Protect and restore the integrity of Earth's ecological systems, with special concern for biological diversity and the natural processes that sustain life.**

- a. Adopt at all levels sustainable development plans and regulations that make environmental conservation and rehabilitation integral to all development initiatives.
- b. Establish and safeguard viable nature and biosphere reserves, including wild lands and marine areas, to protect Earth's life support systems, maintain biodiversity, and preserve our natural heritage.
- c. Promote the recovery of endangered species and ecosystems.
- d. Control and eradicate non-native or genetically modified organisms harmful to native species and the environment, and prevent introduction of such harmful organisms.
- e. Manage the use of renewable resources such as water, soil, forest products, and marine life in ways that do not exceed rates of regeneration and that protect the health of ecosystems.
- f. Manage the extraction and use of non-renewable resources such as minerals and fossil fuels in ways that minimize depletion and cause no serious environmental damage.

**6. Prevent harm as the best method of environmental protection and, when knowledge is limited, apply a precautionary approach.**

- a. Take action to avoid the possibility of serious or irreversible environmental harm even when scientific knowledge is incomplete or inconclusive.
- b. Place the burden of proof on those who argue that a proposed activity will not cause significant harm, and make the

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responsible parties liable for environmental harm.

- c. Ensure that decision making addresses the cumulative, long-term, indirect, long distance, and global consequences of human activities.
- d. Prevent pollution of any part of the environment and allow no build-up of radioactive, toxic, or other hazardous substances.
- e. Avoid military activities damaging to the environment.

**7. Adopt patterns of production, consumption, and reproduction that safeguard Earth's regenerative capacities, human rights, and community well-being.**

- a. Reduce, reuse, and recycle the materials used in production and consumption systems, and ensure that residual waste can be assimilated by ecological systems.
- b. Act with restraint and efficiency when using energy, and rely increasingly on renewable energy sources such as solar and wind.
- c. Promote the development, adoption, and equitable transfer of environmentally sound technologies.
- d. Internalize the full environmental and social costs of goods and services in the selling price, and enable consumers to identify products that meet the highest social and environmental standards.
- e. Ensure universal access to health care that fosters reproductive health and responsible reproduction.
- f. Adopt lifestyles that emphasize the quality of life and material sufficiency in a finite world.

**8. Advance the study of ecological sustainability and promote the open exchange and wide application of the knowledge acquired.**

- a. Support international scientific and technical cooperation on sustainability, with special attention to the needs of developing nations.
- b. Recognize and preserve the traditional knowledge and spiritual wisdom in all cultures that contribute to environmental protection and human well-being.
- c. Ensure that information of vital importance to human health and environmental protection, including genetic information, remains available in the public domain.

**III. SOCIAL AND ECONOMIC JUSTICE**

**9. Eradicate poverty as an ethical, social, and environmental imperative.**

- a. Guarantee the right to potable water, clean air, food security, uncontaminated soil, shelter, and safe sanitation, allocating the national and international resources required.
- b. Empower every human being with the education and resources to secure a sustainable livelihood, and provide social security and safety nets for those who are unable to support themselves.
- c. Recognize the ignored, protect the vulnerable, serve those who suffer, and enable them to develop their capacities and to pursue their aspirations.

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**10. Ensure that economic activities and institutions at all levels promote human development in an equitable and sustainable manner.**

- a. Promote the equitable distribution of wealth within nations and among nations.
- b. Enhance the intellectual, financial, technical, and social resources of developing nations, and relieve them of onerous international debt.
- c. Ensure that all trade supports sustainable resource use, environmental protection, and progressive labor standards.
- d. Require multinational corporations and international financial organizations to act transparently in the public good, and hold them accountable for the consequences of their activities.

**11. Affirm gender equality and equity as prerequisites to sustainable development and ensure universal access to education, health care, and economic opportunity.**

- a. Secure the human rights of women and girls and end all violence against them.
- b. Promote the active participation of women in all aspects of economic, political, civil, social, and cultural life as full and equal partners, decision makers, leaders, and beneficiaries.
- c. Strengthen families and ensure the safety and loving nurture of all family members.

**12. Uphold the right of all, without discrimination, to a natural and social environment supportive of human dignity, bodily health, and spiritual well-being, with special attention to the rights of indigenous peoples and minorities.**

- a. Eliminate discrimination in all its forms, such as that based on race, color, sex, sexual orientation, religion, language, and national, ethnic or social origin.
- b. Affirm the right of indigenous peoples to their spirituality, knowledge, lands and resources and to their related practice of sustainable livelihoods.
- c. Honor and support the young people of our communities, enabling them to fulfill their essential role in creating sustainable societies.
- d. Protect and restore outstanding places of cultural and spiritual significance.

**IV. DEMOCRACY, NONVIOLENCE, AND PEACE**

**13. Strengthen democratic institutions at all levels, and provide transparency and accountability in governance, inclusive participation in decision making, and access to justice.**

- a. Uphold the right of everyone to receive clear and timely information on environmental matters and all development plans and activities which are likely to affect them or in which they have an interest.
- b. Support local, regional and global civil society, and promote the meaningful participation of all interested individuals and organizations in decision making.
- c. Protect the rights to freedom of opinion, expression, peaceful assembly, association, and dissent.
- d. Institute effective and efficient access to administrative and independent judicial procedures, including remedies and redress for environmental harm and the threat of such harm.
- e. Eliminate corruption in all public and private institutions.
- f. Strengthen local communities, enabling them to care for their environments, and assign environmental responsibilities to the levels of government where they can be carried out most effectively.

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**14. Integrate into formal education and life-long learning the knowledge, values, and skills needed for a sustainable way of life.**

- a. Provide all, especially children and youth, with educational opportunities that empower them to contribute actively to sustainable development.
- b. Promote the contribution of the arts and humanities as well as the sciences in sustainability education.
- c. Enhance the role of the mass media in raising awareness of ecological and social challenges.
- d. Recognize the importance of moral and spiritual education for sustainable living.

**15. Treat all living beings with respect and consideration.**

- a. Prevent cruelty to animals kept in human societies and protect them from suffering.
- b. Protect wild animals from methods of hunting, trapping, and fishing that cause extreme, prolonged, or avoidable suffering.
- c. Avoid or eliminate to the full extent possible the taking or destruction of non-targeted species.

**16. Promote a culture of tolerance, nonviolence, and peace.**

- a. Encourage and support mutual understanding, solidarity, and cooperation among all peoples and within and among nations.
- b. Implement comprehensive strategies to prevent violent conflict and use collaborative problem solving to manage and resolve environmental conflicts and other disputes.
- c. Demilitarize national security systems to the level of a non-provocative defense posture, and convert military resources to peaceful purposes, including ecological restoration.
- d. Eliminate nuclear, biological, and toxic weapons and other weapons of mass destruction.
- e. Ensure that the use of orbital and outer space supports environmental protection and peace.
- f. Recognize that peace is the wholeness created by right relationships with oneself, other persons, other cultures, other life, Earth, and the larger whole of which all are a part.

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**APPENDIX C3**  
**THE LWF PRINCIPLES**  
(LWF, 2000)

**LUTHERAN WORLD FEDERATION**  
**GUIDING PRINCIPLES FOR SUSTAINABLE DEVELOPMENT<sup>2</sup>**

**GENERAL PRINCIPLES**

**1. Sustainable development is a holistic and interconnected process**

Sustainable development is as much a process as a goal, leading to a life of dignity for people in relationship to the overall context of their community and the environment which sustains them. Development that isolates a person from part of himself or herself, from the community or from the ecosystem which supports life is not sustainable. As well, development of a local area that is not linked to the sustainability of the social, economic and environmental wellbeing of the human family is likewise not sustainable.

**2. Sustainable development is non-discriminatory and protects the dignity of each person**

Sustainable development promotes the God-given dignity of each person. It does not discriminate on the basis of race, colour, sex, language, religion, political or other opinion, national or social origin, property, birth or other status. It seeks to enhance the dignity of the whole human family.

**3. The well-being of human persons is the priority concern of sustainable development**

Sustainable development is human-centred. It is concerned with the lives and well-being of people in their communities, rather than with narrow economic indicators averaged out over localities, nations or regions. It is concerned with the well-being of the whole person, physical, spiritual and psychological and with the realization of the potential of each individual, in the context of his or her community.

**4. Sustainable development is culturally and spiritually sensitive**

The goals and priorities for tackling human rights issues, gender equality, and environmental issues will vary from country to country due to local socio-economic, cultural and spiritual contexts. Although cultural and religious practices can both support and inhibit development, development cannot be sustainable unless the positive cultural and spiritual practices of persons and communities are recognized, enhanced and incorporated into the development process.

**5. Sustainable development does not assume the superiority of any one model of economic and social governance**

Sustainable development should embrace, as appropriate and as desired by the community concerned, native or traditional models of economic and social governance as readily as the dominant models of politics and economic growth. Pejorative value judgements of 'underdevelopment' are to be avoided.

**6. Sustainable development is participatory**

Development cannot succeed unless the people involved actively participate in and support the process. To the extent possible participation means involvement of all interest groups in all relevant aspects of development: identifying, planning, implementing, monitoring and evaluating development endeavours. Sustainable development equips people to assume responsibility for their own future and the well-being of the communities and nations to which they belong.

**7. Capacity building is a means as well as a goal of sustainable development**

Sustainable development enhances the capacity of persons and communities to determine their own future and to increase the utilization of available local and human resources. Development which is imposed or remains dependent upon outside support is not sustainable. Therefore a priority of all development activities should be to engage in and demonstrate the full participation that is necessary to support community life over the long term.

**8. Financial sustainability is necessary for the effective promotion of sustainable development**

Financial sustainability relates to the capacity to create long-term financial stability or security for sustainable development initiatives. In the case of income-generating initiatives, clear business plans are a critical tool for ensuring success. Any necessary investments in capital goods require proper projections of running, maintenance and replacement costs. In relation to human resources, the costs associated with the development of those human resources and skills must be incorporated in the financial projections.

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<sup>2</sup> Note: The numbering has been altered so that in this extract the it commences at 1.

**9. Sustainable development depends on institutional sustainability**

The critical issues of institutional sustainability relate to the management of human resources, decision-making processes and accountability. Proper personnel policies and regulations, human resource development plans, performance assessments, representative (including a gender balance) and transparent decision-making processes, adequate monitoring and reporting systems, and policies and planning that focus on future financial independence and institutional autonomy are essential to institutional sustainability.

**10. Sustainable development focuses on community assets**

The starting point for promoting sustainable development should be the identification of the assets of the community in facing and responding to its self-defined development objectives.

**11. Sustainable development is technologically appropriate**

Development is not sustainable unless the technical elements of development are in harmony with and related to the social, economic, cultural and ecological settings in which they are being used. The use of more and more sophisticated technology should not be equated with an increase in sustainability of development. Neither should the absence of advanced technologies necessarily be equated with a lack of development.

**12. Sustainable development is dependent on adequate conditions for health and education**

Without adequate provision for health and education development processes are not sustainable. Primary health care, basic education and other processes which are community based, incorporate the expertise and capacities of local people, and equip communities to be active agents in their own well-being are integral to sustainable development.

**13. Sustainable development includes advocacy for socio-economic and political conditions for human well-being**

Advocacy involves working with others to mobilize public opinion regarding the root causes of development problems. Awareness raising is integral to people's understanding that leads to advocacy and political participation. Advocacy for sustainable development involves all people of good will in all places working towards justice, and includes concrete and symbolic acts of peace and reconciliation.

**14. The promotion of peace and reconciliation is an essential function and precondition of sustainable development**

Development planning, particularly for communities that have experienced recent conflict, must incorporate effective conflict prevention and reconciliation strategies in order to promote sustainability of development. Such strategies should extend from community based trauma healing, reconciliation and conflict resolution programs to direct political initiatives in peace promotion and conflict mediation, where appropriate.

**15. Sustainable development requires equitable and effective resource sharing**

Over-consumption and lack of sharing of available resources is an obstacle to achieving sustainable development. It must be recognized that resource sharing within the LWF member churches and related agencies is based upon resources that individual member churches and related agencies are able and prepared to devote to the benefit of others. Such sharing of resources is essential to the institutional capacity of the LWF to promote and participate in sustainable development.

**THE HUMAN RIGHTS DIMENSION****16. Human rights and the mission of the church**

Human rights principles are the legal expression of the God-given dignity of every human person, which the church is called to protect and promote. Insofar as human rights represent the minimum conditions for human well-being to which every person is entitled, a human rights ministry also reflects the compassion of Christ for a suffering humanity.

**17. The realization of all human rights represents the essential goal of development**

As understood in the framework of the 'right to development', development involves the realization of all human rights – economic, social and cultural, as well as civil and political rights. The right to development, so understood, is not a new and separate right to a narrowly economic concept of development, but a vehicle for the realization of all human rights.

**18. Development objectives are also human rights objectives**

The objectives of development are not limited to narrow technical objectives, but constitute a broad agenda for promoting human dignity and well-being. The complete spectrum of human rights, encompassing civil and political rights as well as economic, social and cultural rights, can be seen as broadly descriptive of the sort of society which development activities are intended to promote. Some of the specific objectives of development are to establish food security, to improve health, to enhance access to education, to create employment opportunities, to share technological and social advances, and to improve living standards. In all of these respects, the objectives of development are also human rights objectives, reflected in the international human rights instruments as the right to food and to freedom from hunger, the right to the highest attainable standard of physical and mental health, the right to education, the right to work, the right to enjoy the benefits

of scientific progress and its applications, and the right to an adequate standard of living.

**19. Human rights include responsibilities**

Human rights also entail responsibilities – to the community “in which alone the free and full development of [one’s] personality is possible”, to “the general welfare in a democratic society”, and to respect the rights and freedoms of others. Human rights imply a general societal intention and responsibility to secure such rights and freedoms for all. In this context, development can be seen as the process by which society seeks to fulfil that responsibility and to realize those rights and freedoms for all its members.

**20. Respect for human rights is a necessary precondition for development; violations of human rights endanger development**

It is clear that serious and widespread violations of human rights preclude sustainable development. For example, if in a given society the right to life, freedom from arbitrary arrest and detention, the right to just and favorable conditions of work, the right to education and the right to enjoy the benefits of scientific progress are not protected and promoted, development will not be sustainable. In addition, serious and widespread violations of human rights typically lead to social instability and conflict, the consequences of which invariably wipe away decades of development efforts.

**21. Religious freedom is a necessary precondition for and objective of development**

Freedom of religion and belief is a human right to which all are entitled. Religious intolerance inhibits sustainable development by fracturing communities and creating an environment conducive to conflict. Religious extremism is in turn encouraged by poverty, deprivation and oppression. Development efforts which effectively address poverty, deprivation and oppression also help to address the root causes of religious extremism.

**22. Promoting human rights strengthens development**

Promoting human rights strengthens development in a number of ways. Protecting and promoting human rights can help to prevent conflicts and social instability based on poverty, discrimination and exclusion (social, economic and political), and can thereby strengthen sustainable development. In addition, the promotion of human rights such as the freedoms of opinion and expression, the right to association, and the freedom of movement encourages the free interchange of ideas and experiences which promotes the spread of development. It is also widely recognized that the most successful and sustainable development activities are those in which there is active democratic participation by the local community.

**23. An emphasis on human rights in the context of development helps to focus attention on the structural inequities that cause and maintain impoverishment and exclusion**

Conscious reference to human rights standards and objectives helps to ensure that the root causes of poverty and exclusion receive proper attention in the formulation and implementation of development programs, and to guard against narrow technical objectives becoming the reference point for development activities.

**24. Human rights obligations are legally binding, and their application in the context of development can therefore strengthen development initiatives**

When a State enters into a treaty, covenant or convention, the provisions of those instruments become legally-binding upon that State. Existing obligations under human rights treaties, covenants or conventions therefore provide a solid legal foundation for development programs, and for helping to ensure state support for such programs.

**25. Integrating human rights analyses into the development planning cycle contributes to sustainable development**

The primary purpose of such an analysis would be to identify human rights factors which, if not addressed, would be likely to jeopardize the sustainability of the development. Human rights deficits identified in the analysis or otherwise observed should be incorporated into the development program in order to contribute to the sustainability of the development activities.

**26. Reflecting the principle of universality of human rights, development activities should be designed to be of benefit to the largest possible number of people**

The growing gap between rich and poor challenges those engaged in promoting sustainable development to ensure that development activities are of benefit to the largest possible number of people. Human rights, including economic, social and cultural rights, are universal, and development activities should endeavor to reflect this principle.

**27. In accordance with the overwhelming international consensus on the rights of the child, and in recognition of the special needs of children, children’s rights should be a priority area for development programs**

Children require special care and protection because of their physical and psychological dependency, their own inherent dignity, and because in them lies the hope for a better and more just world. Development activities should therefore prioritize the needs and rights of children, and find ways to engage the creative energies of children as the agents of future

social transformation.

### **THE GENDER DIMENSION**

#### **28. The protection and promotion of the human rights of women are fundamental to the sustainability of development**

In the development process unequal power relations between men and women result in unequal distribution of and exclusion from the benefits of development. Because women are disadvantaged by most standards of comparison, the protection of the human rights of women and the equal participation of women are critical elements in the development process. The centrality of women's role not only in the family and community but also in the process of development necessitates the full implementation of the human rights of women and of the girl child as an inalienable, integral and indivisible part of all human rights and fundamental freedoms.

#### **29. Sustainable development processes require that the root causes of inequality between men and women are addressed and acted upon**

The root causes of gender inequality for women include lack of powersharing, restricted participation in society, devaluation of experience and work, and violence against women. Sustainable development can only occur in a context where these broader issues are assessed and responded to by men and women together. Specific advocacy will need to be undertaken to change public attitudes and practices as well as to institutionalize gender equality through the change of public and organizational policy.

#### **30. Sustainable development requires gender equality and the full leadership of women in all development processes**

Sustainable development can only take place when there is active involvement of all members of the community. It requires a gender analysis of the roles of both men and women within the family community and their relations to each other. In order to raise the status of women, which is necessary for sustainable development, the active participation of both men and women is imperative. As well, in order to be sustainable, development must benefit women and men alike and hold a vision for a better future for children.

#### **31. Improving the status of women requires the participation of both men and women; addressing gender issues must be the concern of all people, not only women**

Advancing the status of women is not the business of women alone, but that of men and women in the community. Active participation of all members of the community is the core of sustainable development including the gender aspects. An understanding of the roles and responsibilities of both men and women in a community as well as their relations to each other are critical. The relations between women and men are the focus of improving the status of women.

#### **32. Sustainable development cannot be gender-neutral**

All development work has a gender impact and does not benefit women and men equally. Gender equality recognizes the differences between men and women that are socially and culturally defined, particularly in relationship to the roles, responsibilities, access to and control over the resources of men and women, and their spheres of authority. If development programs are not intentionally addressing gender equality they have the result of reinforcing patterns of injustice and exclusion for women. For this reason it is essential to recognize and analyze the effects of all development processes on gender.

#### **33. The participation and empowerment of women in present as well as future programs is a means as well as a goal in the process of sustainable development**

The very process of inclusion of women in decision-making processes changes relationships between women and men, as well as changing decisions which are taken in the community and the way in which those decisions are carried out. It is not sufficient to solely undertake programs for the benefit of women. Full community participation initiates the gender equality which it also seeks to achieve.

#### **34. All assessment, planning, monitoring and evaluation in development work require a gender perspective and analysis which values the work and experience of women**

Gender sensitive development demands gender analysis which includes sex desegregated data for all development indicators, including: the improvement of women's access to education and health care; the gender division of labour; access to and control over resources and the distribution of benefits, and social, economic and environmental factors which influence a particular gender arrangement.

**35. Specific programs and projects for women will continue to need investment in order to ensure that women are fully involved in the development process.**

Sustainable development requires gender sensitive planning which has the objective of promoting gender equality through meeting the practical needs of women. These on the ground practical needs include those that women have for survival and economic advancement, as well as strategic gender interests which are concerned with improving women's position and empowering them to have more access to resources and more equal participation in decision-making.

**THE ENVIRONMENT DIMENSION**

**36. Sustainable development is environment aware, preserving, maintaining and regenerating the natural resource base**

Sustainable development is only achieved when long-term human needs are satisfied without threatening the resource base on which future generations depend. It requires responsible management of the environment and natural resources. Ecological considerations need to be integrated into identification and formulation of work in food security, soil conservation and regeneration, increased agricultural productivity, sustained population growth, afforestation, strengthening emergency preparedness for natural disasters, and rural and urban health and sanitation needs.

**37. Sustainable development aims at lasting human stewardship of nature**

The stewardship of creation involves ensuring that resource use is not only sustainable but also equitable. It implies that limited resources will be used in the most careful and efficient manner. In the process of rehabilitation it means that restoration of the environment to an original state is not necessarily adequate, since 'the original state' may often be far from ideal for sustainable development. An appropriate rehabilitation cycle should progress - from stabilization to restoration to improvement to sustainable development - all the while maintaining sustainable development as the final objective.

**38. Sustainable development involves incorporating concern for the environment in all development decisions and operations**

Environmental problems can be caused, overcome or mitigated by almost any decision or operation. To minimize negative environmental impacts, it is essential to incorporate environmental considerations into all aspects or sectors of development.

**39. Environmental conservation includes participation and responsibility**

The only way that the use of local natural resources can be made sustainable is by fully involving all resource users. Damage-prevention and mitigation measures in rehabilitation and development activities need to be based on awareness creation and involving the concerned population in decision making. The special role of women as resource managers and disseminators should be observed. Participation has proved to be an important tool in supporting all mitigative and preventive environmental measures. Community leaders need to be made aware of their particular responsibility for the protection of the surrounding environment.

**40. Sustainable development provides for social justice in access to, management and use of resources**

The claims of local populations to rights of access to, management and use of, important natural resources should be seriously studied and, if justified, supported by organizations promoting development. It is of vital importance that the disadvantaged and the poorest sections of the community have equitable access to resources. As environmental care has a lot to do with ownership or use of available natural resources, the exercise of those rights by local populations may prove to be a determining factor in the success of sustainable development work. Moreover, it is above all in the field of land tenure and users rights that development organizations may play an important role in ensuring development based on genuine stewardship of nature, including organizing users, and assisting them to take steps to assert their rights.

**41. Sustainable development includes taking shared responsibilities for environmental damage**

The responsibilities for environmental consequences of environmental damage should be shared on a fair basis by all actors concerned. There is usually no one single actor who can be held responsible for environmental impacts. Commercial enterprises, the home government, the host government, the local population, the international community - all are part of both problems and solutions. This fact is also a fundamental principle in the PRA (Participatory Rural Appraisal) method as communities themselves discover their link and relationship with the environment that they are living in.

**42. Sustainable development includes making sure that financial resources for environmental operations are selected according to criteria which measure the surplus of benefits generated by these interventions**

Financial resources are often scarce. Their optimal use can be achieved by comparing the costs and benefits of environmental operations - including the cost of environmental damage they help to avoid - and proposing the optimum intervention mix in monetary terms.

**43. Sustainable development includes linking international economic interests and commitment to the environment**

There is a direct linkage between international economic interests and the impact on the environment. Responsible environmental practice should be seen as necessary for sustainable economic vitality of the economy at the international and local levels. Opportunities should be sought for increased interaction between business, government and civil society to ensure that protection of the environment is incorporated into commercial policies.

**44. Sustainable development includes linking community economic interests and commitment for environment**

One very effective way of involving people in environmental activities is to ensure that they are based on viable income generation which will contribute to both improved environmental management, and sustainable development by supporting the livelihood and local economy of responsible resource managers. Development programs need to introduce appropriate technologies and practices, to provide necessary support in terms of skills training, extension and credit.

**45. Sustainable development includes environmental education, awareness-raising and advocacy actions**

Environmental education is a vital accompanying measure for all development activities, reinforcing the message that local natural resources need to be used in a sustainable manner. Such education should be undertaken vigorously among communities undergoing development.

**46. Sustainable development includes using indigenous knowledge**

Traditional knowledge of natural resources and their use needs to be fully utilized. There is an obvious need to promote and replicate good practice in environment management. Traditional knowledge usually provides a wealth of information on which adapted, new resource management systems can be based.

**47. Sustainable development includes working for peace and reconciliation between countries and communities in order to avoid environmental devastation caused by conflict**

War has devastating consequences for the environment. Effective action to protect the environment includes economic and political initiatives to address the root causes of warfare and conflict, including extreme poverty.

**THE COMMUNICATION DIMENSION****48. Communication builds community**

Communication builds human communities and allows them to develop. Without communication there cannot be a strong community; without a strong community there cannot be sustainable development. The free exchange of information, ideas and experiences contribute to the development of the whole community and in turn the whole person.

**49. Sustainable development depends upon effective communication**

Effective communication is essential for enabling local communities to identify their needs and to convey them to others. Inasmuch as participation in the development process by the communities concerned is recognized as essential to promoting sustainable development, communication methodologies must be established which ensure effective participation by those communities in the decision-making process. Communication strategies must also seek to ensure the widest possible dissemination and exchange of information on development experiences and lessons learned, in order to promote a widening and deepening of the development process.

**50. Capacity-building in communications**

An important element of promoting sustainable development is capacity-building in communications. This should involve not only capacity-building in the use of modern communications technologies, but also training in culturally appropriate communication, and techniques for overcoming communication barriers and resolving disputes. Training should also promote effective communication within communities for the identification and implementation of development objectives.

**51. Communication methodologies must be relevant and appropriate**

The advent of modern communications technologies has undoubtedly increased exponentially the possibilities for exchanging information and creating solidarity. However, care must be taken to identify technologies which are most suited to the communication purpose. The most advanced communications technologies may or may not be the best or most effective for every community. The important factor is that whatever communications methodologies are employed, they should be accepted by and accessible to the whole community.

**52. Communication strategies should make maximum use of traditional forms of communication**

Although modern methods of communications can have very powerful development-enhancing effects, they can also

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threaten traditional cultures and means of communication. In addition to appropriate elements of modern communication technologies, traditional methods of communication should be employed to promote the dissemination of development. These should especially include interpersonal and group communication forms and practices.

**53. Networking for development**

The building of networks within and between communities, and with relevant agencies and instrumentalities, is essential for a continuing and active development process. The identification of appropriate partners in such networks is a crucial factor in the long-term viability of development initiatives. Such networks promote the exchange of relevant information and expertise in a mutually supportive way.

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## APPENDIX C4 THE GTZ PRINCIPLES<sup>3</sup>

(Extracted from Burger, 1997: 8 - 17; Burger & Mayer, 2003: 15 - 31)

### **Sustainable development principles as formulated for the *Deutsche Gesellschaft für Technische Zusammenarbeit***

**Vision:** Sustainable development construed as a global partnership for economically viable, socially just, ecologically sound development, not only for the present, but also for the future.

#### **1. Resource Management for Inter-Generational Equity Principle**

- regeneration rule
- substitution rule
- burden intensity rule
- precautionary hazard containment rule
- integrated resource budget management rule.

#### **2. Efficiency Principle**

Technical rationalisation, efficient allocation of resources by the market, if

- prices reflect scarcity,
- frameworks are conducive to innovation and sustainability
- ecological and social frameworks.

#### **3. Social Justice Principle**

- allocation of benefits and costs
- access to resources, information and decision-making processes
- protection against risks
- opportunities for self-development
- power wielding and conflict transformation.

#### **4. Partnership Principle**

- respect for competence and culture
- definition of roles
- ability to engage in open dialogue.

#### **5. Coherency Principle**

Illumination and negotiation of:

- horizontal inconsistencies
- vertical inconsistencies
- temporal inconsistencies

with other systems.

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<sup>3</sup> A fuller exposition of these principles is provided in the main text.

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**APPENDIX C5**  
**THE ICMM PRINCIPLES**  
(ICMM, 2003)

**ICMM SUSTAINABLE DEVELOPMENT FRAMEWORK**

As members of International Council on Mining and Metals (ICMM) or as companies that have otherwise agreed to take on the same performance obligations as ICMM members, we seek continual improvement in our performance and contribution to sustainable development so as to enhance shareholder value.<sup>4</sup> In striving to achieve this, we will:

**1. Implement and maintain ethical business practices and sound systems of corporate governance.**

- Develop and implement company statements of ethical business principles and practices that management is committed to enforcing.
- Implement policies and practices that seek to prevent bribery and corruption.
- Comply with or exceed the requirements of host-country laws and regulations.
- Work with governments, industry and other stakeholders to achieve appropriate and effective public policy, laws, regulations and procedures that facilitate the mining, minerals and metals sector's contribution to sustainable development within national sustainable development strategies.

**2. Integrate sustainable development considerations within the corporate decision-making process.**

- Integrate sustainable development principles into company policies and practices.
- Plan, design, operate and close operations in a manner that enhances sustainable development.
- Implement good practice and innovate to improve social, environmental and economic performance while enhancing shareholder value.
- Encourage customers, business partners and suppliers of goods and services to adopt principles and practices that are comparable to our own.
- Provide sustainable development training to ensure adequate competency at all levels among our own employees and those of contractors.
- Support public policies and practices that foster open and competitive markets.

**3. Uphold fundamental human rights and respect cultures, customs and values in dealings with employees and others who are affected by our activities.**

- Ensure fair remuneration and work conditions for all employees and do not use forced, compulsory or child labour.
- Provide for the constructive engagement of employees on matters of mutual concern.
- Implement policies and practices designed to eliminate harassment and unfair discrimination in all aspects of our activities.
- Ensure that all relevant staff, including security personnel, are provided with appropriate cultural and human rights training and guidance.
- Minimise involuntary resettlement, and compensate fairly for adverse effects on the community where they cannot be avoided.
- Respect the culture and heritage of local communities, including indigenous peoples.

**4. Implement risk management strategies based on valid data and sound science.**

- Consult with interested and affected parties in the identification, assessment and management of all significant social, health, safety, environmental and economic impacts associated with our activities.

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<sup>4</sup> The ICMM has adopted the Brundtland Commission's definition of sustainable development: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". In the mining and metals sector, this means that investments should be financially profitable, technically appropriate, environmentally sound and socially responsible.

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- Ensure regular review and updating of risk management systems.
- Inform potentially affected parties of significant risks from mining, minerals and metals operations and of the measures that will be taken to manage the potential risks effectively.
- Develop, maintain and test effective emergency response procedures in collaboration with potentially affected parties.

**5. Seek continual improvement of our health and safety performance.**

- Implement a management system focussed on continual improvement of all aspects of operations that could have a significant impact on the health and safety of our own employees, those of contractors and the communities where we operate.
- Take all practical and reasonable measures to eliminate workplace fatalities, injuries and diseases among our own employees and those of contractors.
- Provide all employees with health and safety training, and require employees of contractors to have undergone such training.
- Implement regular health surveillance and risk-based monitoring of employees.
- Rehabilitate and reintegrate employees into operations following illness or injury, where feasible.

**6. Seek continual improvement of our environmental performance.**

- Assess the positive and negative, the direct and indirect, and the cumulative environmental impacts of new projects – from exploration through closure.
- Implement an environmental management system focused on continual improvement to review, prevent, mitigate or ameliorate adverse environmental impacts.
- Rehabilitate land disturbed or occupied by operations in accordance with appropriate post-mining land uses.
- Provide for safe storage and disposal of residual wastes and process residues.
- Design and plan all operations so that adequate resources are available to meet the closure requirements of all operations.

**7. Contribute to conservation of biodiversity and integrated approaches to land use planning.**

- Respect legally designated protected areas.
- Disseminate scientific data on and promote practices and experiences in biodiversity assessment and management.
- Support the development and implementation of scientifically sound, inclusive and transparent procedures for integrated approaches to land use planning, biodiversity, conservation and mining.

**8. Facilitate and encourage responsible product design, use, re-use, recycling and disposal of our products.**

- Advance understanding of the properties of metals and minerals and their lifecycle effects on human health and the environment.
- Conduct or support research and innovation that promotes the use of products and technologies that are safe and efficient in their use of energy, natural resources and other materials.
- Develop and promote the concept of integrated materials management throughout the metals and minerals value chain.
- Provide regulators and other stakeholders with scientifically sound data and analysis regarding our products and operations as a basis for regulatory decisions.
- Support the development of scientifically sound policies, regulations, product standards and material choice decisions that encourage the safe use of mineral and metal products.

**9. Contribute to the social, economic and institutional development of the communities in which we operate.**

- Engage at the earliest practical stage with likely affected parties to discuss and respond to issues and conflicts concerning the management of social impacts.
- Ensure that appropriate systems are in place for ongoing interaction with affected parties, making sure that minorities and other marginalised groups have equitable and culturally appropriate means of

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engagement.

- Contribute to community development from project development through closure in collaboration with host communities and their representatives.
- Encourage partnerships with governments and non-governmental organisations to ensure that programmes (such as community health, education, local business development) are well designed and effectively delivered.
- Enhance social and economic development by seeking opportunities to address poverty.

**10. Implement effective and transparent engagement, communication and independently verified reporting arrangements with our stakeholders.**

- Report on our economic, social and environmental performance and contribution to sustainable development.
- Provide information that is timely, accurate and relevant.
- Engage with and respond to stakeholders through open consultation processes.

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## APPENDIX C6 THE OECD PRINCIPLES (OECD, 1995)

### EXTRACTS FROM THE *ENVIRONMENTAL PRINCIPLES AND CONCEPTS OF THE ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT*

#### SUSTAINABLE DEVELOPMENT AND RELATED PRINCIPLES AND CONCEPTS

##### 1. Sustainable Development Principle<sup>5</sup>

"*Sustainable development*" is widely recognised as an emerging principle of international law, although there is no generally accepted legal definition of this term. The following concepts, among others, may contribute towards sustainable development:

Policy Integration: Economic, ecological, and social goals are interdependent and can be achieved only with an integrated approach:

- Economic Progress: Economic development can proceed in a way that enables the achievement of full economic growth potential while maintaining the stock of assets that yield these benefits.
- Ecological Resilience: Environmental protection is an integral part of the development process. Enabling the resilience of biological and physical systems is critical to our long-term economic and social security.
- Social Development: Breaking the vicious circle of population growth, poverty, and environmental degradation is the key to achieving sustainable development. So too is the preservation of cultural diversity and the advancement of social justice.

Sustainable Resource Use. Natural resource exploitation should proceed in a way and at a rate that does not lead to the long-term decline of these resources and guards against their future exhaustion.

Equity: Natural resources should be used and shared in an equitable manner, which implies taking into account the needs of other users and also the needs of present and future generations.

Transparency and Public Participation: Citizens should participate in environmental decision-making and have appropriate access to information and to judicial and administrative proceedings.

Biodiversity: National and international development strategies should be developed on the premise that the protection of biodiversity is critical to the resilience of the global ecosystem, which incorporates all aspects of the biosphere including man-made environments.

##### 2. Ecological Interdependence

This includes:

- acknowledgment of the ecological limits and connectedness of the planet's biological and physical systems, and
- recognition of the dependence of humankind on nature and the environment for continued survival.

##### 3. Intergenerational Equity and Intragenerational Equity

- The concept of "*intergenerational equity*" recognises each generation's responsibility to be fair to the next generation by leaving a legacy of wealth no less than they themselves had inherited.
- The concept of "*intragenerational equity*" recognizes that the lessening of economic inequality in the current generation must be seen as a primary goal of development.

##### 4. Common but Differentiated Responsibilities

The concept of "*common but differentiated responsibilities*" refers to the shared responsibilities

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<sup>5</sup> The numbers as applied to the principles of this document, have been added to facilitate discussion.

of countries for the protection of shared resources, with the caveat that these responsibilities may be different depending on the contribution of the country to the environmental problem and its capability for addressing the environmental problem. In other words, developed countries will be asked to carry more of the immediate burden of achieving sustainable development on a global basis, because they may contribute more to environmental degradation and they have greater financial and technical resources.

### 5. Shared or Transboundary Resources

- The concept of "*shared or transboundary resources*" refers to resources that do not fall wholly within the territorial jurisdiction of one country, but straddle common political borders or migrate from one territory to another. Examples of resources which may be shared or transboundary include river basins, enclosed and semi-enclosed seas, watershed areas, marine living resources, and migratory wildlife. Most environmental agreements for the management of shared resources contain the general obligation for the harmonious utilisation of such resources among countries based on co-operation, notification and consultation.
- The concept of shared or transboundary resources is to be considered alongside the principle of "*permanent sovereignty*", a basic principle of international law. Traditionally, natural resources located wholly within national boundaries have been considered to be within the jurisdiction of national laws.
- However, the principle of permanent sovereignty is not absolute. As knowledge of the ecological interdependence of the planet broadens, the principle of "*permanent sovereignty*" over natural resources is slowly being conditioned to reflect the concept of "*shared or transboundary resources*."

### 6. Harm Prevention

The notion that countries must ensure that activities within their jurisdiction or control do not damage the environment of other countries through "*transboundary spillover effects*" is a customary principle of international environmental law. This demonstrates, once again, that the principle of permanent sovereignty is not absolute but rather subject to a general duty not to harm the interests of other countries through transboundary pollution or resource degradation.

### 7. Global Commons

The concept of "*global commons*" refers to those areas beyond the limits of national jurisdiction such as the high seas, Antarctica, outer space and the ozone layer. Although the global commons are open for legitimate, peaceful and reasonable use by all nations, they cannot be appropriated by any one nation. Countries should cooperate in the conservation and sustainable utilisation of the natural resources of the global commons, and, in the purest application of this concept, should share in the economic wealth of those areas.

### 8. International Co-operation

- "*International co-operation*", widely acknowledged as a customary principle of international law, relates to the legal obligation of countries to cooperate with other countries in cases of transboundary and global environmental concerns.
- In application of this principle, countries are further asked to respect the concept of "*prior notification*" which obliges nations planning an activity to transmit to potentially affected nations all necessary information sufficiently in advance so that the latter can prevent damage to its territory, and, if necessary, enter into consultation.

## POLLUTER PAYS PRINCIPLE AND RELATED PRINCIPLES AND CONCEPTS

### 9. Polluter Pays Principle

- The "*Polluter Pays Principle*" states that the polluter should bear the expenses of carrying out pollution prevention measures or paying for damage caused by pollution.
- In the OECD context, the Polluter Pays Principle is a non-subsidisation principle, meaning simply that governments should not as a general rule give subsidies to their industries for pollution control.

### 10. Internalisation of Environmental Costs

The concept of "*internalisation of environmental costs*" implies that market prices should reflect the environmental costs of the production and use of a product in terms of natural resource utilisation, pollution, waste generation, consumption, disposal and other factors.

### 11. User Pays Principle

The "*User Pays Principle*" centres around the idea that the user of a public facility, or consumer of a public good, pays for the environmental good or service or the damages which may arise from that use.

## PRECAUTIONARY PRINCIPLE AND RELATED CONCEPTS

### 12. Precautionary Principle

The "*Precautionary Principle*" evolved from the recognition that scientific certainty often comes too late to design effective environmental policy responses; it thus states that where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

### 13. Risk Management

The concept of "*risk management*," which is closely related to the Precautionary Principle, involves assessing an environmental risk or potential environmental impact and making decisions based on that assessment. The overall objective of risk management is to reduce risks to human health and the environment. The environmental risk management process is based on four steps: (1) identifying the hazards to society or the environment; (2) estimating the extent of these hazards, including the probability of exposure and the relative toxicity of the agent; (3) ascertaining the acceptability of that level of risk; and (4) making a decision to reduce the risk to the appropriate level.

### 14. Pollution Prevention

"*Pollution prevention*" is an environmental management approach which places emphasis on process and product changes leading to pollution reduction and/or prevention over approaches which focus on pollution control or clean-up through end-of-pipe devices. Therefore, "*clean technologies*", which are total systems for preventing pollution throughout the life-cycle of a product, contribute to pollution prevention. Key characteristics of clean technologies include: the use of as little energy and raw material inputs as possible per unit of product output; minimal releases to air, water and soil during fabrication and use of the product; the production of goods with reduced or no harmful components; and maximisation of the durability and lifetime of products and their re-usability or disposability.

### 15. Critical Load

The concept of "*critical load*" refers to an ecosystem's level of tolerance for a particular pollutant and also to an ecosystem's level of tolerance for the depletion of a particular natural resource, beyond which irreversible damage will likely occur.

### 16. Life-Cycle Assessment

The concept of "*life-cycle assessment*" mark the evolution of environmental management practices from an initial focus on end-of-pipe solutions to the development of integrated environmental approaches intended to encompass the entire "*life-cycle*" of the product. This approach is often referred to as "*cradle-to-grave*" environmental management or, within the context of rising expectations of the recycling and re-use potential of products, "*cradle-to-cradle*" environmental management. It is an analytic tool developed by industry, particularly the chemicals sector, life-cycle assessment is intended to evaluate each stage in the life of a product, from the initial appropriation of raw materials and per unit energy and other production inputs, to product re-use, recyclability and disposal characteristics.

### 17. Environmental Impact Assessment

"*Environmental Impact Assessment*" (EIA) is a process for examining, analysing and assessing proposed activities in order to minimise environmental degradation and maximise the potential for environmentally-sound and sustainable development. In general, the EIA process should ensure that:

- government authorities have fully identified and considered the environmental effects of proposed activities, as well as alternatives that avoid or mitigate environmental effects; and
- affected citizens have an opportunity to understand the proposed project or policy and to express their views to decision-makers in advance.

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**APPENDIX C7**  
**THE *COMHAR* PRINCIPLES**  
(Extracted from Comhar, undated)

**Preamble**

Sustainable development must encompass environmental protection, economic development, and social development in an integrated manner. Sustainable development is a process in which these three objectives, which can be mutually reinforcing, are addressed on an equal footing. Actions which fail to take account of the need for a harmonious balance between the three objectives may undermine the system as a whole, even if progress is made in one particular area. Implementation of sustainable development requires a consensus-based decision making process involving all parties concerned. Therefore, the principles developed by *Comhar* needed to address all three objectives. An *a la carte* approach to the principles is therefore not appropriate. All must be pursued, and in tandem.

**A. SATISFACTION OF HUMAN NEEDS BY THE EFFICIENT USE OF RESOURCES<sup>6</sup>**

1. The use of non-renewable resources should be minimised.
2. Use of hazardous/polluting substances and wastes created should be minimised; waste management should be environmentally sound.

**B. EQUITY BETWEEN GENERATIONS**

3. Renewable resources should be used within the capacity for regeneration.
4. The quality of soils and water resources should be maintained and improved.

**C. RESPECT FOR ECOLOGICAL INTEGRITY AND BIODIVERSITY**

5. The diversity of wildlife, habitats and species should be maintained and improved.

**D. EQUITY BETWEEN COUNTRIES AND REGIONS**

6. Air and atmosphere should be protected and human-induced effects on climate minimised.
7. The development of resource potential in one region should not compromise the ability of other regions to achieve their own potential.

**E. SOCIAL EQUITY**

8. Social inclusion should be promoted to ensure an improved quality of life for all.
9. Sustainable development depends on co-operation and agreement between states.

**F. RESPECT FOR CULTURAL HERITAGE/DIVERSITY**

10. The quality of landscapes, the heritage of the man-made environment and historic and cultural resources should be maintained and improved.

**G. GOOD DECISION-MAKING**

11. Decision-making should be devolved to the appropriate level.
12. Stakeholder participation should be promoted at all levels of decision-making .

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<sup>6</sup> Note: The themes (headings) have been lettered alphabetically to facilitate discussion

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**APPENDIX C8**  
**THE NSESD PRINCIPLES**  
(Australia, 1992)

**FROM THE AUSTRALIAN *NATIONAL STRATEGY FOR ECOLOGICALLY SUSTAINABLE DEVELOPMENT***

**Preamble:**

The definition for Ecologically Sustainable Development in Australia:

using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.

There are two main features which distinguish an ecologically sustainable approach to development:

- we need to consider, in an integrated way, the wider economic, social and environmental implications of our decisions and actions for Australia, the international community and the biosphere; and
- we need to take a long-term rather than short-term view when taking those decisions and actions.

**Australia's goal, core objectives and guiding principles for the Strategy**

**The Goal is:**

Development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends.

**The Core Objectives are:<sup>7</sup>**

1. to enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations
2. to provide for equity within and between generations
3. to protect biological diversity and maintain essential ecological processes and life-support systems

**The Guiding Principles are:**

4. decision making processes should effectively integrate both long and short-term economic, environmental, social and equity considerations
5. where there are threats of serious or irreversible environmental damage, lack of full scientific

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<sup>7</sup> Note: The objectives and principles have been numbered to facilitate discussion and entries into the comparative table in Appendix C14.

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certainty should not be used as a reason for postponing measures to prevent environmental degradation

6. the global dimension of environmental impacts of actions and policies should be recognised and considered
7. the need to develop a strong, growing and diversified economy which can enhance the capacity for environmental protection should be recognised
8. the need to maintain and enhance international competitiveness in an environmentally sound manner should be recognised
9. cost effective and flexible policy instruments should be adopted, such as improved valuation, pricing and incentive mechanisms
10. decisions and actions should provide for broad community involvement on issues which affect them.

These guiding principles and core objectives need to be considered as a package. No objective or principle should predominate over the others. A balanced approach is required that takes into account all these objectives and principles to pursue the goal of ESD.

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**APPENDIX C9**  
**THE UK PRINCIPLES**  
(Defra, 2005)

**EXTRACTS FROM *SECURING THE FUTURE***  
**THE UK GOVERNMENT SUSTAINABLE DEVELOPMENT STRATEGY**

**Preamble**

The goal of sustainable development is to enable all people throughout the world to satisfy their basic needs and enjoy a better quality of life, without compromising the quality of life of future generations.

For the UK Government and the Devolved Administrations, that goal will be pursued in an integrated way through a sustainable, innovative and productive economy that delivers high levels of employment; and a just society that promotes social inclusion, sustainable communities and personal wellbeing. This will be done in ways that protect and enhance the physical and natural environment, and use resources and energy as efficiently as possible.

Government must promote a clear understanding of, and commitment to, sustainable development so that all people can contribute to the overall goal through their individual decisions.

Similar objectives will inform all our international endeavours, with the UK actively promoting multilateral and sustainable solutions to today's most pressing environmental, economic and social problems. There is a clear obligation on more prosperous nations both to put their own house in order, and to support other countries in the transition towards a more equitable and sustainable world.

**1. Living Within Environmental Limits<sup>8</sup>**

Respecting the limits of the planet's environment, resources and biodiversity – to improve our environment and ensure that the natural resources needed for life are unimpaired and remain so for future generations.

**2. Ensuring a Strong, Healthy and Just Society**

Meeting the diverse needs of all people in existing and future communities, promoting personal wellbeing, social cohesion and inclusion, and creating equal opportunity for all.

**3. Achieving a Sustainable Economy**

Building a strong, stable and sustainable economy which provides prosperity and opportunities for all, and in which environmental and social costs fall on those who impose them (polluter pays), and efficient resource use is incentivised.

**4. Promoting Good Governance**

Actively promoting effective, participative systems of governance in all levels of society – engaging people's creativity, energy, and diversity.

**5. Using Sound Science Responsibly**

Ensuring policy is developed and implemented on the basis of strong scientific evidence, whilst taking into account scientific uncertainty (through the precautionary principle) as well as public attitudes and values.

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<sup>8</sup> Notes: – Numbering has been added to facilitate discussion and entries in to the summarising table in Appendix C14.  
– In the original document, *Securing the future*, principles 1 and 2 appear as main principles, from which principles 3, 4, and 5 flow.

**APPENDIX C10**  
**THE NEMA PRINCIPLES**  
(South Africa, 1998)

**FROM THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT 107 OF 1998**

**Principles<sup>9</sup>**

- (1) The principles set out in this section apply throughout the Republic to the actions of all organs of state that may significantly affect the environment and —
  - (a) shall apply alongside all other appropriate and relevant considerations, including the State's responsibility to respect, protect, promote and fulfil the social and economic rights in Chapter 2 of the Constitution and in particular the basic needs of categories of persons disadvantaged by unfair discrimination;
  - (b) serve as the general framework within which environmental management and implementation plans must be formulated;
  - (c) serve as guidelines by reference to which any organ of state must exercise any function when taking any decision in terms of this Act or any statutory provision concerning the protection of the environment;
  - (d) serve as principles by reference to which a conciliator appointed under this Act must make recommendations; and
  - (e) guide the interpretation, administration and implementation of this Act, and any other law concerned with the protection or management of the environment.
- (2) Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.
- (3) Development must be socially, environmentally and economically sustainable.
- (4) Sustainable development requires the consideration of all relevant factors including the following:
  - (a) That the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
  - (b) that pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
  - (c) that the disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or where it cannot be altogether avoided, is minimised and remedied;
  - (d) that waste is avoided, or where it cannot be altogether avoided, minimised and reused or recycled where possible and otherwise disposed of in a responsible manner;
  - (e) that the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource;
  - (f) that the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised;
  - (g) that a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and
  - (h) that negative impacts on the environment and on people's environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied.
- (5) Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated, and it must take into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option.
- (6) Environmental justice must be pursued so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons.
- (7) Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human

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<sup>9</sup> Note that the paragraph numbers 5 to 21 have been added (in place of lettering) to facilitate discussion and entries into the comparative table in Appendix C14.

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wellbeing must be pursued and special measures may be taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination.

- (8) Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle.
- (9) The participation of all interested and affected parties in environmental governance must be promoted, and all people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, and participation by vulnerable and disadvantaged persons must be ensured.
- (10) Decisions must take into account the interests, needs and values of all interested and affected parties, and this includes recognising all forms of knowledge, including traditional and ordinary knowledge.
- (11) Community wellbeing and empowerment must be promoted through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means.
- (12) The social, economic and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated, and decisions must be appropriate in the light of such consideration and assessment.
- (13) The right of workers to refuse work that is harmful to human health or the environment and to be informed of dangers must be respected and protected.
- (14) Decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the law.
- (15) There must be intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment.
- (16) Actual or potential conflicts of interest between organs of state should be resolved through conflict resolution procedures.
- (17) Global and international responsibilities relating to the environment must be discharged in the national interest.
- (18) The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage.
- (19) The costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment.
- (20) The vital role of women and youth in environmental management and development must be recognised and their full participation therein must be promoted.
- (21) Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

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**APPENDIX C11**  
**THE UNCHE PRINCIPLES**  
(UNCHE, 1972)

**DECLARATION OF THE UNITED NATIONS CONFERENCE  
ON THE HUMAN ENVIRONMENT**

The United Nations Conference on the Human Environment, having met at Stockholm from 5 to 16 June 1972, having considered the need for a common outlook and for common principles to inspire and guide the peoples of the world in the preservation and enhancement of the human environment,

Proclaims that:

1. Man is both creature and moulder of his environment, which gives him physical sustenance and affords him the opportunity for intellectual, moral, social and spiritual growth. In the long and tortuous evolution of the human race on this planet a stage has been reached when, through the rapid acceleration of science and technology, man has acquired the power to transform his environment in countless ways and on an unprecedented scale. Both aspects of man's environment, the natural and the man-made, are essential to his well-being and to the enjoyment of basic human rights the right to life itself.

2. The protection and improvement of the human environment is a major issue which affects the well-being of peoples and economic development throughout the world; it is the urgent desire of the peoples of the whole world and the duty of all Governments.

3. Man has constantly to sum up experience and go on discovering, inventing, creating and advancing. In our time, man's capability to transform his surroundings, if used wisely, can bring to all peoples the benefits of development and the opportunity to enhance the quality of life. Wrongly or heedlessly applied, the same power can do incalculable harm to human beings and the human environment. We see around us growing evidence of man-made harm in many regions of the earth: dangerous levels of pollution in water, air, earth and living beings; major and undesirable disturbances to the ecological balance of the biosphere; destruction and depletion of irreplaceable resources; and gross deficiencies, harmful to the physical, mental and social health of man, in the man-made environment, particularly in the living and working environment.

4. In the developing countries most of the environmental problems are caused by under-development. Millions continue to live far below the minimum levels required for a decent human existence, deprived of adequate food and clothing, shelter and education, health and sanitation. Therefore, the developing countries must direct their efforts to development, bearing in mind their priorities and the need to safeguard and improve the environment. For the same purpose, the industrialized countries should make efforts to reduce the gap themselves and the developing countries. In the industrialized countries, environmental problems are generally related to industrialization and technological development.

5. The natural growth of population continuously presents problems for the preservation of the environment, and adequate policies and measures should be adopted, as appropriate, to face these problems. Of all things in the world, people are the most precious. It is the people that propel social progress, create social wealth, develop science and technology and, through their hard work, continuously transform the human environment. Along with social progress and the advance of production, science and technology, the capability of man to improve the environment increases with each passing day.

6. A point has been reached in history when we must shape our actions throughout the world with a more prudent care for their environmental consequences. Through ignorance or indifference we can do massive and irreversible harm to the earthly environment on which our life and well being depend. Conversely, through fuller knowledge and wiser action, we can achieve for ourselves and our posterity a better life in an environment more in keeping with human needs and hopes. There are broad vistas for the enhancement of environmental quality and the creation of a good life. What is needed is an enthusiastic but calm state of mind and intense but orderly work. For the purpose of attaining freedom in the world of nature, man must use knowledge to build, in collaboration with nature, a better environment. To defend and improve the human environment for present and future generations has become an imperative goal for mankind-a goal to be pursued together with, and in harmony with, the established and fundamental goals of peace and of worldwide economic and social development.

7. To achieve this environmental goal will demand the acceptance of responsibility by citizens and communities and by enterprises and institutions at every level, all sharing equitably in common efforts. Individuals in all walks of life as well as organizations in many fields, by their values and the sum of their actions, will shape the world environment of the future.

Local and national governments will bear the greatest burden for large-scale environmental policy and action within their jurisdictions. International cooperation is also needed in order to raise resources to support the developing countries in carrying out their responsibilities in this field. A growing class of environmental problems, because they are regional or global in extent or because they affect the common international realm, will require extensive cooperation among nations and action by international organizations in the common interest. The Conference calls upon Governments and peoples to exert common efforts for the preservation and improvement of the human environment, for the benefit of all the people and for their posterity.

### **Principles**

States the common conviction that:

#### Principle 1

Man has the fundamental right to freedom, equality and adequate conditions of life, in an environment of a quality that permits a life of dignity and well-being, and he bears a solemn responsibility to protect and improve the environment for present and future generations. In this respect, policies promoting or perpetuating apartheid, racial segregation, discrimination, colonial and other forms of oppression and foreign domination stand condemned and must be eliminated.

#### Principle 2

The natural resources of the earth, including the air, water, land, flora and fauna and especially representative samples of natural ecosystems, must be safeguarded for the benefit of present and future generations through careful planning or management, as appropriate.

#### Principle 3

The capacity of the earth to produce vital renewable resources must be maintained and, wherever practicable, restored or improved.

#### Principle 4

Man has a special responsibility to safeguard and wisely manage the heritage of wildlife and its habitat, which are now gravely imperilled by a combination of adverse factors. Nature conservation, including wildlife, must therefore receive importance in planning for economic development.

#### Principle 5

The non-renewable resources of the earth must be employed in such a way as to guard against the danger of their future exhaustion and to ensure that benefits from such employment are shared by all mankind.

#### Principle 6

The discharge of toxic substances or of other substances and the release of heat, in such quantities or concentrations as to exceed the capacity of the environment to render them harmless, must be halted in order to ensure that serious or irreversible damage is not inflicted upon ecosystems. The just struggle of the peoples of ill countries against pollution should be supported.

#### Principle 7

States shall take all possible steps to prevent pollution of the seas by substances that are liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea.

#### Principle 8

Economic and social development is essential for ensuring a favorable living and working environment for man and for creating conditions on earth that are necessary for the improvement of the quality of life.

#### Principle 9

Environmental deficiencies generated by the conditions of under-development and natural disasters pose grave problems and can best be remedied by accelerated development through the transfer of substantial quantities of financial and technological assistance as a supplement to the domestic effort of the developing countries and such timely assistance as may be required.

#### Principle 10

For the developing countries, stability of prices and adequate earnings for primary commodities and raw materials are essential to environmental management, since economic factors as well as ecological processes must be taken into account.

Principle 11

The environmental policies of all States should enhance and not adversely affect the present or future development potential of developing countries, nor should they hamper the attainment of better living conditions for all, and appropriate steps should be taken by States and international organizations with a view to reaching agreement on meeting the possible national and international economic consequences resulting from the application of environmental measures.

Principle 12

Resources should be made available to preserve and improve the environment, taking into account the circumstances and particular requirements of developing countries and any costs which may emanate- from their incorporating environmental safeguards into their development planning and the need for making available to them, upon their request, additional international technical and financial assistance for this purpose.

Principle 13

In order to achieve a more rational management of resources and thus to improve the environment, States should adopt an integrated and coordinated approach to their development planning so as to ensure that development is compatible with the need to protect and improve environment for the benefit of their population.

Principle 14

Rational planning constitutes an essential tool for reconciling any conflict between the needs of development and the need to protect and improve the environment.

Principle 15

Planning must be applied to human settlements and urbanization with a view to avoiding adverse effects on the environment and obtaining maximum social, economic and environmental benefits for all. In this respect projects which are designed for colonialist and racist domination must be abandoned.

Principle 16

Demographic policies which are without prejudice to basic human rights and which are deemed appropriate by Governments concerned should be applied in those regions where the rate of population growth or excessive population concentrations are likely to have adverse effects on the environment of the human environment and impede development.

Principle 17

Appropriate national institutions must be entrusted with the task of planning, managing or controlling the environmental resources of States with a view to enhancing environmental quality.

Principle 18

Science and technology, as part of their contribution to economic and social development, must be applied to the identification, avoidance and control of environmental risks and the solution of environmental problems and for the common good of mankind.

Principle 19

Education in environmental matters, for the younger generation as well as adults, giving due consideration to the underprivileged, is essential in order to broaden the basis for an enlightened opinion and responsible conduct by individuals, enterprises and communities in protecting and improving the environment in its full human dimension. It is also essential that mass media of communications avoid contributing to the deterioration of the environment, but, on the contrary, disseminates information of an educational nature on the need to protect and improve the environment in order to enable all to develop in every respect.

Principle 20

Scientific research and development in the context of environmental problems, both national and multinational, must be promoted in all countries, especially the developing countries. In this connection, the free flow of up-to-date scientific information and transfer of experience must be supported and assisted, to facilitate the solution of environmental problems; environmental technologies should be made available to developing countries on terms which would encourage their wide dissemination without constituting an economic burden on the developing countries.

Principle 21

States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of

national jurisdiction.

Principle 22

States shall cooperate to develop further the international law regarding liability and compensation for the victims of pollution and other environmental damage caused by activities within the jurisdiction or control of such States to areas beyond their jurisdiction.

Principle 23

Without prejudice to such criteria as may be agreed upon by the international community, or to standards which will have to be determined nationally, it will be essential in all cases to consider the systems of values prevailing in each country, and the extent of the applicability of standards which are valid for the most advanced countries but which may be inappropriate and of unwarranted social cost for the developing countries.

Principle 24

International matters concerning the protection and improvement of the environment should be handled in a cooperative spirit by all countries, big and small, on an equal footing. Cooperation through multilateral or bilateral arrangements or other appropriate means is essential to effectively control, prevent, reduce and eliminate adverse environmental effects resulting from activities conducted in all spheres, in such a way that due account is taken of the sovereignty and interests of all States.

Principle 25

States shall ensure that international organizations play a coordinated, efficient and dynamic role for the protection and improvement of the environment.

Principle 26

Man and his environment must be spared the effects of nuclear weapons and all other means of mass destruction. States must strive to reach prompt agreement, in the relevant international organs, on the elimination and complete destruction of such weapons.

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**APPENDIX C12**  
**THE UNCED PRINCIPLES**  
(UNCED, 1992)

**RIO DECLARATION ON ENVIRONMENT AND DEVELOPMENT**

**The United Nations Conference on Environment and Development,**

**Having met** at Rio de Janeiro from 3 to 14 June 1992,

**Reaffirming** the Declaration of the United Nations Conference on the Human Environment, adopted at Stockholm on 16 June 1972, and seeking to build upon it,

**With the goal** of establishing a new and equitable global partnership through the creation of new levels of cooperation among States, key sectors of societies and people,

**Working towards** international agreements which respect the interests of all and protect the integrity of the global environmental and developmental system,

**Recognizing** the integral and interdependent nature of the Earth, our home,

**Proclaims that:**

Principle 1

Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature.

Principle 2

States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental and developmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.

Principle 3

The right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations.

Principle 4

In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it.

Principle 5

All States and all people shall cooperate in the essential task of eradicating poverty as an indispensable requirement for sustainable development, in order to decrease the disparities in standards of living and better meet the needs of the majority of the people of the world.

Principle 6

The special situation and needs of developing countries, particularly the least developed and those most environmentally vulnerable, shall be given special priority. International actions in the field of environment and development should also address the interests and needs of all countries.

Principle 7

States shall cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth's ecosystem. In view of the different contributions to global environmental degradation, States have common but

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differentiated responsibilities. The developed countries acknowledge the responsibility that they bear in the international pursuit to sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command.

Principle 8

To achieve sustainable development and a higher quality of life for all people, States should reduce and eliminate unsustainable patterns of production and consumption and promote appropriate demographic policies.

Principle 9

States should cooperate to strengthen endogenous capacity-building for sustainable development by improving scientific understanding through exchanges of scientific and technological knowledge, and by enhancing the development, adaptation, diffusion and transfer of technologies, including new and innovative technologies.

Principle 10

Environmental issues are best handled with participation of all concerned citizens, at the relevant level. At the national level, each individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided.

Principle 11

States shall enact effective environmental legislation. Environmental standards, management objectives and priorities should reflect the environmental and development context to which they apply. Standards applied by some countries may be inappropriate and of unwarranted economic and social cost to other countries, in particular developing countries.

Principle 12

States should cooperate to promote a supportive and open international economic system that would lead to economic growth and sustainable development in all countries, to better address the problems of environmental degradation. Trade policy measures for environmental purposes should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade. Unilateral actions to deal with environmental challenges outside the jurisdiction of the importing country should be avoided. Environmental measures addressing transboundary or global environmental problems should, as far as possible, be based on an international consensus.

Principle 13

States shall develop national law regarding liability and compensation for the victims of pollution and other environmental damage. States shall also cooperate in an expeditious and more determined manner to develop further international law regarding liability and compensation for adverse effects of environmental damage caused by activities within their jurisdiction or control to areas beyond their jurisdiction.

Principle 14

States should effectively cooperate to discourage or prevent the relocation and transfer to other States of any activities and substances that cause severe environmental degradation or are found to be harmful to human health.

Principle 15

In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

Principle 16

National authorities should endeavour to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment.

Principle 17

Environmental impact assessment, as a national instrument, shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent national authority.

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Principle 18

States shall immediately notify other States of any natural disasters or other emergencies that are likely to produce sudden harmful effects on the environment of those States. Every effort shall be made by the international community to help States so afflicted.

Principle 19

States shall provide prior and timely notification and relevant information to potentially affected States on activities that may have a significant adverse transboundary environmental effect and shall consult with those States at an early stage and in good faith.

Principle 20

Women have a vital role in environmental management and development. Their full participation is therefore essential to achieve sustainable development.

Principle 21

The creativity, ideals and courage of the youth of the world should be mobilized to forge a global partnership in order to achieve sustainable development and ensure a better future for all.

Principle 22

Indigenous people and their communities and other local communities have a vital role in environmental management and development because of their knowledge and traditional practices. States should recognize and duly support their identity, culture and interests and enable their effective participation in the achievement of sustainable development.

Principle 23

The environment and natural resources of people under oppression, domination and occupation shall be protected.

Principle 24

Warfare is inherently destructive of sustainable development. States shall therefore respect international law providing protection for the environment in times of armed conflict and cooperate in its further development, as necessary.

Principle 25

Peace, development and environmental protection are interdependent and indivisible.

Principle 26

States shall resolve all their environmental disputes peacefully and by appropriate means in accordance with the Charter of the United Nations.

Principle 27

States and people shall cooperate in good faith and in a spirit of partnership in the fulfilment of the principles embodied in this Declaration and in the further development of international law in the field of sustainable development.

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**APPENDIX C13**  
**THE WSSD PRINCIPLES**  
(WSSD, 2002)

**UNITED NATIONS WORLD SUMMIT ON SUSTAINABLE DEVELOPMENT**  
**Johannesburg Declaration on Sustainable Development**

**From our origins to the future**

1. We, the representatives of the peoples of the world, assembled at the World Summit on Sustainable Development in Johannesburg, South Africa, from 2 to 4 September 2002, reaffirm our commitment to sustainable development.
2. We commit ourselves to building a humane, equitable and caring global society, cognizant of the need for human dignity for all.
3. At the beginning of this Summit, the children of the world spoke to us in a simple yet clear voice that the future belongs to them, and accordingly challenged all of us to ensure that through our actions they will inherit a world free of the indignity and indecency occasioned by poverty, environmental degradation and patterns of unsustainable development.
4. As part of our response to these children, who represent our collective future, all of us, coming from every corner of the world, informed by different life experiences, are united and moved by a deeply felt sense that we urgently need to create a new and brighter world of hope.
5. Accordingly, we assume a collective responsibility to advance and strengthen the interdependent and mutually reinforcing pillars of sustainable development — economic development, social development and environmental protection — at the local, national, regional and global levels.
6. From this continent, the cradle of humanity, we declare, through the Plan of Implementation of the World Summit on Sustainable Development and the present Declaration, our responsibility to one another, to the greater community of life and to our children.
7. Recognizing that humankind is at a crossroads, we have united in a common resolve to make a determined effort to respond positively to the need to produce a practical and visible plan to bring about poverty eradication and human development.

**From Stockholm to Rio de Janeiro to Johannesburg**

8. Thirty years ago, in Stockholm, we agreed on the urgent need to respond to the problem of environmental deterioration. Ten years ago, at the United Nations Conference on Environment and Development, held in Rio de Janeiro, we agreed that the protection of the environment and social and economic development are fundamental to sustainable development, based on the Rio Principles. To achieve such development, we adopted the global programme entitled Agenda 21 and the Rio Declaration on Environment and Development, to which we reaffirm our commitment. The Rio Conference was a significant milestone that set a new agenda for sustainable development.
9. Between Rio and Johannesburg, the world's nations have met in several major conferences under the auspices of the United Nations, including the International Conference on Financing for Development, as well as the Doha Ministerial Conference. These conferences defined for the world a comprehensive vision for the future of humanity.
10. At the Johannesburg Summit, we have achieved much in bringing together a rich tapestry of peoples and views in a constructive search for a common path towards a world that respects and implements the vision of sustainable development. The Johannesburg Summit has also confirmed that significant progress has been made towards achieving a global consensus and partnership among all the people of our planet.

**The challenges we face**

11. We recognize that poverty eradication, changing consumption and production patterns and protecting and managing

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the natural resource base for economic and social development are overarching objectives of and essential requirements for sustainable development.

12. The deep fault line that divides human society between the rich and the poor and the ever-increasing gap between the developed and developing worlds pose a major threat to global prosperity, security and stability.

13. The global environment continues to suffer. Loss of biodiversity continues, fish stocks continue to be depleted, desertification claims more and more fertile land, the adverse effects of climate change are already evident, natural disasters are more frequent and more devastating, and developing countries more vulnerable, and air, water and marine pollution continue to rob millions of a decent life.

14. Globalization has added a new dimension to these challenges. The rapid integration of markets, mobility of capital and significant increases in investment flows around the world have opened new challenges and opportunities for the pursuit of sustainable development. But the benefits and costs of globalization are unevenly distributed, with developing countries facing special difficulties in meeting this challenge.

15. We risk the entrenchment of these global disparities and unless we act in a manner that fundamentally changes their lives the poor of the world may lose confidence in their representatives and the democratic systems to which we remain committed, seeing their representatives as nothing more than sounding brass or tinkling cymbals.

#### **Our commitment to sustainable development**

16. We are determined to ensure that our rich diversity, which is our collective strength, will be used for constructive partnership for change and for the achievement of the common goal of sustainable development.

17. Recognizing the importance of building human solidarity, we urge the promotion of dialogue and cooperation among the world's civilizations and peoples, irrespective of race, disabilities, religion, language, culture or tradition.

18. We welcome the focus of the Johannesburg Summit on the indivisibility of human dignity and are resolved, through decisions on targets, timetables and partnerships, to speedily increase access to such basic requirements as clean water, sanitation, adequate shelter, energy, health care, food security and the protection of biodiversity. At the same time, we will work together to help one another gain access to financial resources, benefit from the opening of markets, ensure capacity-building, use modern technology to bring about development and make sure that there is technology transfer, human resource development, education and training to banish underdevelopment forever.

19. We reaffirm our pledge to place particular focus on, and give priority attention to, the fight against the worldwide conditions that pose severe threats to the sustainable development of our people, which include: chronic hunger; malnutrition; foreign occupation; armed conflict; illicit drug problems; organized crime; corruption; natural disasters; illicit arms trafficking; trafficking in persons; terrorism; intolerance and incitement to racial, ethnic, religious and other hatreds; xenophobia; and endemic, communicable and chronic diseases, in particular HIV/AIDS, malaria and tuberculosis.

20. We are committed to ensuring that women's empowerment, emancipation and gender equality are integrated in all the activities encompassed within Agenda 21, the Millennium development goals and the Plan of Implementation of the Summit.

21. We recognize the reality that global society has the means and is endowed with the resources to address the challenges of poverty eradication and sustainable development confronting all humanity. Together, we will take extra steps to ensure that these available resources are used to the benefit of humanity.

22. In this regard, to contribute to the achievement of our development goals and targets, we urge developed countries that have not done so to make concrete efforts reach the internationally agreed levels of official development assistance.

23. We welcome and support the emergence of stronger regional groupings and alliances, such as the New Partnership for Africa's Development, to promote regional cooperation, improved international cooperation and sustainable development.

24. We shall continue to pay special attention to the developmental needs of small island developing States and the least developed countries.

25. We reaffirm the vital role of the indigenous peoples in sustainable development.

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26. We recognize that sustainable development requires a long-term perspective and broad-based participation in policy formulation, decision-making and implementation at all levels. As social partners, we will continue to work for stable partnerships with all major groups, respecting the independent, important roles of each of them.

27. We agree that in pursuit of its legitimate activities the private sector, including both large and small companies, has a duty to contribute to the evolution of equitable and sustainable communities and societies.

28. We also agree to provide assistance to increase income-generating employment opportunities, taking into account the Declaration on Fundamental Principles and Rights at Work of the International Labour Organization.

29. We agree that there is a need for private sector corporations to enforce corporate accountability, which should take place within a transparent and stable regulatory environment.

30. We undertake to strengthen and improve governance at all levels for the effective implementation of Agenda 21, the Millennium development goals and the Plan of Implementation of the Summit.

### **Multilateralism is the future**

31. To achieve our goals of sustainable development, we need more effective, democratic and accountable international and multilateral institutions.

32. We reaffirm our commitment to the principles and purposes of the Charter of the United Nations and international law, as well as to the strengthening of multilateralism. We support the leadership role of the United Nations as the most universal and representative organization in the world, which is best placed to promote sustainable development.

33. We further commit ourselves to monitor progress at regular intervals towards the achievement of our sustainable development goals and objectives.

### **Making it happen!**

34. We are in agreement that this must be an inclusive process, involving all the major groups and Governments that participated in the historic Johannesburg Summit.

35. We commit ourselves to act together, united by a common determination to save our planet, promote human development and achieve universal prosperity and peace.

36. We commit ourselves to the Plan of Implementation of the World Summit on Sustainable Development and to expediting the achievement of the time-bound, socio-economic and environmental targets contained therein.

37. From the African continent, the cradle of humankind, we solemnly pledge to the peoples of the world and the generations that will surely inherit this Earth that we are determined to ensure that our collective hope for sustainable development is realized.

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## APPENDIX C14

### SUMMARY OF THE REVIEWED SETS OF SUSTAINABLE DEVELOPMENT PRINCIPLES

(See explanatory notes at the bottom of the table)

SOURCE OF PRINCIPLES:	CftE	EC	LWF	GTZ	ICMM	OECD	Comhar	NSESD	UK	NEMA	UNCHE	UNCED	WSSD	PSDF
APPENDIX NO:	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C16
NUMBER OF PRINCIPLES:	9	16+	53	5+	10+	17+	12	10	5	21+	26	27	37	21
1 RESPECT FOR LIFE	1	1,2,15						0						1.1
2 Priority of human beings	8	1	3							2	0	1	2	1.1*
3 HOLISM	0	16	1	5				0		5		25		1.2
4 Interdependence of life	1	1				2								1.2
5 Temporal - inter-generational equity	1	4		1		1,3	B,8	0,1,2	1,2		1,2	3		1.2
6 Temporal - long term thinking		6		5				0,4		8			26	1.2
7 Spatial integration	8	6		5				6						1.2
8 Institutional and policy integration				5	7	1					13,14			1.2
9 Interdisciplinary approach (env, soc, econ)	8		1,38	5	2,4	1	0	0,4		3,12	15		5	1.2,1.3
10 ENVIRONMENTAL SUSTAINABILITY	3	5	36		6	1	C		0,1	3	2,12	4,23	13,35	1.3
11 Carrying capacity limits	5	7	36	2		1,15	1		1					2.1
12 Sustainable renewable resource use	3	5	37	1			3,4			4	3			2.1
13 Limited non-renewable resource use	4	5	37	1			1,4			4	5			2.1
14 Waste assimilation capacity				1		15	2				6			2.1
15 Conserve life support systems	3	5					6	3	1					2.2
16 Conserve biodiversity	3	5			7	1	5	3	1	4,18,21	4		18	2.2
17 Precautionary principle		6		1		12	2	5	5	4		15		2.3
18 Pollution prevention / minimisation		6				14	2			4	7			2.4



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	<b>SOURCE OF PRINCIPLES:</b>	<b>CftE</b>	<b>EC</b>	<b>LWF</b>	<b>GTZ</b>	<b>ICMM</b>	<b>OECD</b>	<b>Comhar</b>	<b>NSESD</b>	<b>UK</b>	<b>NEMA</b>	<b>UNCHE</b>	<b>UNCED</b>	<b>WSSD</b>	<b>PSDF</b>
40	Gender rights		<b>11</b>	<b>28-35</b>							<b>20</b>		<b>20</b>	<b>20</b>	3.4
41	Youth rights		12	<b>27</b>							<b>20</b>		<b>21</b>		3.4
42	Rights of indigenous peoples		<b>12</b>		3	3							<b>22</b>	25	3.4
43	Power relationships / disadv. groups		9		3								<b>6</b>		3.4
44	Right of refusal										<b>13</b>				
45	Tolerance		<b>16</b>												
46	Freedom from crime / violence	2	3											19	5.1
47	Responsibility		2	<b>6,19,59</b>											<b>3.5</b>
48	<b>ECONOMIC SUSTAINABILITY</b>		<b>10</b>	<b>8</b>			<b>1</b>		<b>1</b>	0,3	<b>3</b>	<b>8</b>			1.3
49	Efficiency (economic)			<b>42</b>	2				<b>9</b>	3					<b>4.1</b>
50	Resource efficiency	8		37	2			A,1							4.1
51	Externalities		7		2		<b>10</b>		9	3			<b>16</b>		4.1
52	Resource substitution				1										2.1
53	Open economic system					2							<b>12</b>	18	
54	Sufficiency (Consumerism)	5	<b>7</b>	15	3								<b>8</b>	<b>11</b>	<b>4.2</b>
55	Polluter pays / compensation		6	<b>41</b>			<b>9</b>			<b>3</b>	<b>19</b>		<b>13,16</b>		<b>4.3</b>
56	Resource user pays	8					<b>11</b>								<b>4.3</b>
57	Growing economy						1		7						
58	<b>INSTITUTIONAL CAPACITY</b>		<b>10,13</b>	<b>9</b>				<b>G</b>		<b>4</b>		17		<b>30</b>	1.3
59	Democracy / Political freedom	2	<b>3,13</b>	13,17,22										15,31	<b>5.1</b>
60	No preference for system of social gov.			<b>5</b>											
61	Justice / Rule of law		<b>3,13</b>	24	3					2					5.2
62	Environmental and administrative justice			<b>40</b>	3					<b>2</b>	<b>4,6</b>		10		5.2

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	<b>SOURCE OF PRINCIPLES:</b>	<b>CftE</b>	<b>EC</b>	<b>LWF</b>	<b>GTZ</b>	<b>ICMM</b>	<b>OECD</b>	<b>Comhar</b>	<b>NSESD</b>	<b>UK</b>	<b>NEMA</b>	<b>UNCHE</b>	<b>UNCED</b>	<b>WSSD</b>	<b>PSDF</b>
63	National framework / co-ordination	8									15				5.2
64	Environmental (sust dev) education	6	8,14	45							11	19			5.2
65	Transparency		13		3	4,7,10	1				14				5.2,5.3
66	Sound science / technology					7,8				5		18,20	9		5.2,5.3
67	Accountability		13	9	3						8			31	5.1,5.2, 5.3
68	Technology / knowledge transfer		7,8	18								20	9	18	3.3
69	Appropriate technology			11,51											5.2,5.3
70	Demographics	5	7									16	8		5.2
71	Urbanisation											15			5.2
72	Traditional knowledge		8	10,46,52				10,11			10				5.2,5.3
73	Laws and policies / standards					1			9				11		5.2,5.3
74	Ongoing assessment / improvement				1	4,5,6								33	5.2,5.3
75	Community assets / rights			10	3	9									3.1
76	Corruption		13		3	1									5.1,5.2, 5.3
77	Environmental assessment					6	13,16,17				12		17		5.2,5.3
78	Devolved and responsive decision-making							11	10	0	10				5.2
79	Corporate governance					1,2									5.3
80	Ethical business practices					1									5.3
81	Triple bottom line		10			10									1.3,5.3
82	Employment conditions		10			3,5									5.2,5.3
83	Risk management					4	13								5,5
84	Safety and health					5					8				3.2

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	SOURCE OF PRINCIPLES:	CftE	EC	LWF	GTZ	ICMM	OECD	Comhar	NSESD	UK	NEMA	UNCHE	UNCED	WSSD	PSDF
85	Private sector duties to the community					<b>9</b>								<b>27,29</b>	5.3
86	Waste management					<b>8</b>									2.4
87	Networking			<b>53</b>	5					0					5.2,5.3
88	Partnership / co-operation				<b>4</b>	1,9								<b>23,34</b>	5.2,5.3
89	International cooperation	<b>9</b>					<b>8</b>	6,7,9				<b>24</b>	<b>7,12,13,27</b>	34	5.4
90	Multinationals / international organisations		10									<b>25</b>		31	5.4
91	Peace / arms restrictions		<b>3,16</b>	<b>14,47</b>	3							<b>26</b>	<b>24,25</b>	19,35	5.4
92	Conflict management			14	3						16				5.2,5.3
93	North vs South	9	8,10		3		<b>4</b>	<b>D</b>		0		<b>9,11,12,23</b>	<b>6,7,11</b>	<b>12,13,22,24</b>	5.4
94	Global commons / obligations	9					7	6,9	<b>6</b>		<b>17</b>	7			5.4
95	Transboundary resources / harm						<b>5,6,7</b>	6,7					<b>2,14,18,19</b>		5.4
96	National interest / sovereignty										17	<b>21</b>	<b>2</b>		5.4
97	International competitiveness								<b>8</b>						
98	International law											<b>22</b>	13		5.4
99	UN agency												<b>26</b>	<b>32</b>	
100	Multilateral agreements											<b>24</b>			5.4
101	Export of waste												<b>14</b>		5.4
102	Globalisation effects													<b>14</b>	5.4

20/04/13

## EXPLANATORY NOTES

1. For the full name of each set of principles refer to the relevant appendix.
2. A '+' sign indicates that in that particular suite there are two categories of principles: 'main' principles and 'sub'-principles. Only the 'main' principles are numbered.
3. Numbers in **bold** type refer either to 'main' principles, or to a direct correspondence with the topic in question.
4. Numbers in non-bold type refer either to a 'sub'-principle under the 'main' principle with that number, or to an indirect correspondence with the topic in question.
5. The number zero refers to the preamble to a set of principles.
6. The themes of the Comhar principles are lettered.

\* Moderated by the notion of moral distance

## APPENDIX C15 THE SHERBROOKE PRINCIPLES<sup>10</sup>

(Extracted from Gagnon, at al., 2009)

GENERAL	ENGINEERING
<b>Environment</b>	
1. Preserve biodiversity and respect all life forms regardless of how useful they are to humankind.	1. Preserve biodiversity considering the potential impacts of a project all over its life cycle.
2. Stay within ecosystems' actual carrying capacity and restore damaged ecosystems.	2. Keep the impacts of projects within the affected ecosystems' carrying capacity.
<b>Environment - Society link</b>	
3. Publicize information on the state of the environment to induce responsible behaviour.	3. Spread information on the impacts of projects to increase awareness and responsibility.
4. Guarantee access to ecosystems services essential to health and well-being.	4. Contribute towards a safe and healthy environment along all phases of a project's life cycle.
<b>Society</b>	
5. Foster social cohesion by limiting exclusion and by protecting basic rights and freedoms.	5. Help people discriminate needs from longings so they can truly increase their well-being.
6. Offer individuals and communities the opportunity to mobilize and increase their capabilities.	6. Ensure that projects contribute towards development of involved people and communities.
<b>Society - Economy link</b>	
7. Allocate in a fair manner benefits and costs related to economic activity and public policies.	7. Distribute the benefits and costs resulting from a project in a fair manner.
8. Organize work and commerce so that every human being can meet their needs.	8. Consider the impact of projects on the labour market and improve the quality of jobs.
<b>Economy</b>	
9. Stimulate innovation on a continuous basis to facilitate the adaptation of the economic system.	9. Support innovation to ensure continuous production of quality goods and services.
10. Maintain a positive, genuine, long term investment considering all types of capital.	10. Verify that the total benefits generated exceed total costs over the whole of a project's life cycle.
<b>Economy - Environment link</b>	
11. Use renewable and non-renewable resources in an efficient manner.	11. Increase the material and energy efficiency of production and consumption activities
12. Replace non-renewable resources by renewable substitutes used below their regeneration rate.	12. Avoid the use of non-renewable resources and use renewable ones below their regeneration rates.
<b>Tri-dimensional link</b>	
13. Enforce the precautionary principle in face of potentially severe social or environmental harm.	13. Enforce the precautionary principle when a project may cause severe social or environmental harm.
14. Seek stakeholder involvement while respecting the accountability and subsidiarity principles.	14. Seek involvement from stakeholders and other professionals to find holistic solutions.
15. Internalize external costs of goods and services with appropriate environmental and social policies.	15. Identify, evaluate and internalize externalities when the context makes possible.

<sup>10</sup> Numbering has been added to facilitate discussion.

## APPENDIX C16

# PRINCIPLES OF SUSTAINABLE DEVELOPMENT INCORPORATED INTO THE PSDF<sup>11</sup>

## 1. THE FOUNDATIONAL PRINCIPLES

### 1.1 The respect for life principle

The founding ethic of sustainable development is respect and care for the community of life.

### 1.2 The holism principle

The interconnectedness of everything is fundamental to sustainable development. It is expressed, inter alia, through:

- the interdependence of life
- inter-generational concern
- long-term thinking
- softening of spatial boundaries
- broad-based education
- multi-disciplinary practice
- integrated planning.

### 1.3 The sustainability principle

Development is only sustainable if capacity is created to secure the integrated realisation of the following objectives:

- environmental integrity
- social cohesion
- economic vitality.

## 2. THE SUBSIDIARY PRINCIPLES: ENVIRONMENTAL DIMENSION

### 2.1 The carrying capacity principle

Natural resource use must be contained to be within the environmental regenerative and absorptive capacities of the earth. This requires the

- use of renewable resources not to exceed the regenerative capacity of the environment
- minimisation and the eventual substitution of non-renewable resource use
- minimisation of waste generation to within the assimilation capacity of the environment.

### 2.2 The conservation principle

Nature is of value, both to humans and in and of itself. To protect nature and natural systems a culture of conservation needs to be nurtured. This will include:

- the conservation of biodiversity
- the conservation of natural life support systems
- the conservation of areas of natural uniqueness and beauty
- the restoration of damaged natural systems
- being respectful of nature.

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<sup>11</sup> The proposed sustainable development framework (PSDF) is set out in Appendix F.

### **2.3 The precautionary principle**

Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

### **2.4 The minimum impact principle**

The ubiquitous human impact on the natural environment requires inter alia that:

- pollution and degradation of the environment be avoided, or, where it cannot be avoided, it be minimised and remedied
- the production of waste be avoided, or where it cannot be avoided, it be minimised and reused or recycled where possible, and otherwise disposed of in a responsible manner
- negative impacts on the environment be anticipated and prevented, and where they cannot be prevented, they be minimised and remedied.

### **2.5 The anti-cruelty principle**

No animal should wilfully and arbitrarily be subjected to cruelty.

## **3. THE SUBSIDIARY PRINCIPLES: SOCIAL DIMENSION**

### **3.1 The fairness principle**

All humans are entitled to fairness in their interactions with each other. This includes:

- recognition of their human rights
- recognition of their cultural rights
- recognition of their environmental rights
- equity in access to resources, opportunities and information for the present and future generations
- freedom from discrimination based on prejudice
- freedom from persecution and oppression
- spiritual and religious freedom.

### **3.2 The human dignity principle**

All humans are entitled to have their basic needs met such that their human dignity is not impaired.

These needs include:

- food
- shelter
- health
- security
- family bonds
- education
- employment
- respite from poverty.

### **3.3 The participation principle**

Humans are entitled to participate in decisions which affect their lives, and to this end effective communication and knowledge transfer are prerequisites.

### **3.4 The empowerment principle**

All disadvantaged groups need to be empowered so that they may participate effectively in societal processes, and also so that they may enjoy full access to the available societal and environmental

benefits. These groups include

- women
- the young
- the old
- indigenous peoples
- racial groups.

### **3.5 The responsibility principle**

All humans and societies have a common but differentiated responsibility to ensure that all their activities contribute towards sustainability.

## **4. THE SUBSIDIARY PRINCIPLES: ECONOMIC DIMENSION**

### **4.1 The efficiency principle**

This principle requires that all resources be used as efficiently as possible. This requires progressive and innovative economic systems that recognise:

- the value of market forces
- the value of full property rights
- the need for the inclusion of externalities
- the limitations of resource substitution.

### **4.2 The sufficiency principle**

While meeting at least the minimum needs of all in society, consumption levels and wealth differentials should be limited by considerations of sustainability and equity.

### **4.3 The user pays principle**

Whoever receives the benefits from environmental resources or services needs to bear the cost. This requires the internalisation of externalities and the application of life cycle analyses. It also implies, in the case of pollution, the cost of the avoidance and treatment thereof, and compensation for those who suffer the negative consequences of such activities.

## **5. THE SUBSIDIARY PRINCIPLES: INSTITUTIONAL DIMENSION**

### **5.1 The democracy principle**

Governments need to create conditions amenable to sustainable development. These include, *inter alia*:

- being representative
- being accountable
- allowing maximum individual freedom
- guaranteeing the other rights as outlined in these principles
- guaranteeing public institutional capacity to carry out these principles
- guaranteeing the rule of law
- combatting crime effectively.

### **5.2 The effective governance principle**

Public institutions need to provide conditions which enable the implementation of all the sustainable development principles. This requires *inter alia*:

- the pursuit of excellence
- administrative competence and justice

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- transparency around processes, assumptions, uncertainties, etc.
- accountability (no corruption)
- a national framework of integrated laws, policies and standards
- co-ordination between the various levels of government
- fair employment practices
- prior and continuing assessment and improvement
- consideration of alternatives
- community engagement
- devolved decision-making
- conflict management
- population control and management of urbanisation
- environmental education
- application of sound science, with recognition of innovation and traditional knowledge
- use of low impact and appropriate technology
- technical adequacy
- networking with other bodies and institutions.

### 5.3 The corporate responsibility principle

Businesses and organisations are required to conduct their operations so as to promote the objectives of sustainable development. This requires adherence to, as appropriate, the conditions as listed under the effective governance principle, and a pro-active stance on all matters dealing with sustainability.

### 5.4 The global principle

The global nature of many environmental issues requires of governments, multi-national companies and international organisations to promote sustainable development through inter alia:

- international co-operation based on the recognition of national sovereignty as well as global responsibilities
- adherence to international law and treaties
- liaison between all role players
- global commons obligations
- consideration and limitation of trans-boundary harm
- recognition of North vs South disparities and obligations
- international peace.

### 5.5 The practicality principle<sup>12</sup>

In order to respond expeditiously and pragmatically to environmental and social challenges sustainable development approaches need to be based on:

- an explicit framework that links vision, values and principles to indicators and assessment criteria
- a limited number of key issues for analysis
- standardising wherever possible
- a pluralistic approach
- awareness that there are inherently conflicting and un-measurable aspects of sustainability<sup>13</sup>
- assessment of the risk involved.<sup>14</sup>

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<sup>12</sup> See the argument made in §7.2.3 for the inclusion of this principle.

<sup>13</sup> This point is taken from the *Guidance on Sustainability* document published by the Engineering Council of the UK. (ECUK, 2009: 5)

<sup>14</sup> As for footnote 13. (ECUK, 2009: 7)

**APPENDIX C17**  
**COMPARING THE PSDF PRINCIPLES WITH THE SHERBROOKE**  
**AND THE NEMA PRINCIPLES**

PSDF Principles			Sherbrooke Principles		NEMA
1.1	The respect for life principle	F	<b>1</b>	E	(2)
1.2	The holism principle	F	10	Ec	<b>5</b>
1.3	The sustainable development principle	F	5, 10	S, Ec	<b>3, 12</b>
2.1	The carrying capacity principle	E	<b>2, 11, 12</b>	E, Ec-E, Ec-E	<b>4</b>
2.2	The conservation principle	E	<b>1, 2</b>	E, E	1, 18, 21
2.3	The precautionary principle	E	<b>13</b>	E-S-Ec	4
2.4	The minimum impact principle	E			<b>4</b>
2.5	The anti-cruelty principle	E			
3.1	The fairness principle	S	<b>4, 5, 7</b>	E-S, S, S-Ec	2, 4, 6, 7
3.2	The dignity principle	S	4, 8	E-S, S-Ec	7
3.3	The participation principle	S	<b>14</b>	E-S-Ec	<b>9</b>
3.4	The empowerment principle	S	<b>6</b>	S	1, <b>9</b> , 11, 20
3.5	The responsibility principle	S	<b>3</b>	E-S	8
4.1	The efficiency principle	Ec	9, 10, 11, 15	Ec, Ec-E, E-S-Ec	
4.2	The sufficiency principle	Ec			
4.3	The user pays principle	Ec	<b>7, 15</b>	S-Ec, E-S-Ec	<b>8, 19</b>
5.1	The democracy principle	I			
5.2	The effective governance principle	I	3, 8, 14, 15	E-S, S-Ec, E-S-Ec x 2	<b>1, 5, 10, 11,</b> <b>12, 14, 15, 16</b>
5.3	The corporate responsibility principle	I	8	S-Ec	
5.4	The global principle	I			<b>17</b>
5.5	The practicality principle	I			

Notes:

Numbers in **bold** indicate an explicit correlation

PSDF = Proposed sustainable development framework (Appendix F)

NEMA= National Environmental Act principles (Appendix C10)

F = Foundational principles

E = Environmental dimension

Ec = Economic dimension

S = Social dimension

I = Institutional dimension

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**APPENDIX D**  
**MECHANISTIC VERSUS ECOLOGICAL WORLD VIEWS**  
 (Sterling, 1990: 82)

<b>MECHANISTIC/CARTESIAN</b>	<b>ECOLOGICAL/HOLISTIC</b>
<b>Descriptors</b> Mechanistic, reductionist, objectivist, technocentric	Organic, holistic, participative, ecocentric
<b>Primary characteristics</b> Fact and value unrelated  Ethics and ordinary life separated  Subject and object separate  People and nature separate – relation is one of domination  Knowledge divisible, value-free, empirical, controlling  Linear concepts of time and causation  Nature understood as being made up of discrete parts; the whole is no more than the sum of its parts  The power of a unit equated with well-being (money, influence, resources)  Emphasis on the quantitative  Emphasis on material reality  Analysis key to understanding  Instrumental values  Few or no technical or ecological limits	Fact and value closely related  Ethics and ordinary life integrated  Subject and object interactive  People and nature inseparable – relation is one of systemic synergy  Knowledge indivisible, value-laden, both empirical and intuitive, empathic  Cyclical concepts of time and causation  Nature understood as being made up of interrelated wholes which are greater than the sum of their parts  The quality of interrelationships between systems equated with well-being  Concern with the qualitative  Concern with physical and metaphysical reality Synthesis given greater emphasis  Instrumental and intrinsic values integrated through systemic values  Ecological limits determine technical limits
<b>Secondary characteristics</b> Centralization of power  Specialization  Emphasis on the competitive  Increasing homogeneity and disintegration  Undifferentiated economic growth	Decentralization of power  Multidimensional approach  Emphasis on the cooperative  Increasing diversity and integration  Steady-state economy or qualitative growth

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## **APPENDIX E THE BELLAGIO PRINCIPLES FOR ASSESSMENT**

(Hardi & Zdan, 1997: 2 - 4)

### **VISION OF SUSTAINABLE DEVELOPMENT**

#### **1. GUIDING VISION AND GOALS**

Assessment of progress toward sustainable development should:

- be guided by a clear vision of sustainable development and goals that define that vision

### **FROM THEORY TO PRACTICE**

#### **2. HOLISTIC PERSPECTIVE**

Assessment of progress toward sustainable development should:

- include review of the whole system as well as its parts
- consider the well-being of social, ecological, and economic sub-systems, their state as well as the direction and rate of change of that state, of their component parts, and the interaction between parts
- consider both positive and negative consequences of human activity, in a way that reflects the costs and benefits for human and ecological systems, in monetary and non-monetary terms

#### **3. ESSENTIAL ELEMENTS**

Assessment of progress toward sustainable development should:

- consider equity and disparity within the current population and between present and future generations, dealing with such concerns as resource use, over-consumption and poverty, human rights, and access to services, as appropriate
- consider the ecological conditions on which life depends
- consider economic development and other, non-market activities that contribute to human/social well-being

#### **4. ADEQUATE SCOPE**

Assessment of progress toward sustainable development should:

- adopt a time horizon long enough to capture both human and ecosystem time scales thus responding to needs of future generations as well as those current to short term decision-making
- define the space of study large enough to include not only local but also long distance impacts on people and ecosystems
- build on historic and current conditions to anticipate future conditions - where we want to go, where we could go

#### **5. PRACTICAL FOCUS**

Assessment of progress toward sustainable development should be based on:

- an explicit set of categories or an organizing framework that links vision and goals to indicators and assessment criteria
- a limited number of key issues for analysis
- a limited number of indicators or indicator combinations to provide a clearer signal of progress
- standardizing measurement wherever possible to permit comparison

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- comparing indicator values to targets, reference values, ranges, thresholds, or direction of trends, as appropriate

## **TRANSPARENCY**

**6. OPENNESS** Assessment of progress toward sustainable development should:

- make the methods and data that are used accessible to all
- make explicit all judgments, assumptions, and uncertainties in data and interpretations

## **7. EFFECTIVE COMMUNICATION**

Assessment of progress toward sustainable development should:

- be designed to address the needs of the audience and set of users
- draw from indicators and other tools that are stimulating and serve to engage decision-makers
- aim, from the outset, for simplicity in structure and use of clear and plain language

## **8. BROAD PARTICIPATION**

Assessment of progress toward sustainable development should:

- obtain broad representation of key grass-roots, professional, technical and social groups, including youth, women, and indigenous people - to ensure recognition of diverse and changing values
- ensure the participation of decision-makers to secure a firm link to adopted policies and resulting action

## **CONTINUITY**

### **9. ONGOING ASSESSMENT**

Assessment of progress toward sustainable development should:

- develop a capacity for repeated measurement to determine trends
- be iterative, adaptive, and responsive to change and uncertainty because systems are complex and change frequently
- adjust goals, frameworks, and indicators as new insights are gained
- promote development of collective learning and feedback to decision- making

### **10. INSTITUTIONAL CAPACITY**

Continuity of assessing progress toward sustainable development should be assured by:

- clearly assigning responsibility and providing ongoing support in the decision-making process
- providing institutional capacity for data collection, maintenance, and documentation
- supporting development of local assessment capacity

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**APPENDIX F**  
**SUSTAINABLE DEVELOPMENT FRAMEWORK**

Please turn the page to see the full framework.

SUSTAINABLE DEVELOPMENT FRAMEWORK				
DESCRIPTOR	DESCRIPTION			
VISION	A sustainable society: one that maximises the well-being of its members while they live in harmony with their environment			
VALUES	Reverence for life, beneficence, fairness			
FOUNDATIONAL PRINCIPLES	The respect for life principle The holism principle The sustainability principle			
DIMENSIONS	<b>Environmental Sustainability</b>	<b>Social Sustainability</b>	<b>Economic Sustainability</b>	<b>Institutional Sustainability</b>
GOALS	Environmental integrity	Social cohesion	Economic vitality	Capacitation
SUBSIDIARY PRINCIPLES	Carrying capacity principle Conservation principle Precautionary principle Minimum impact principle Anti-cruelty principle	Fairness principle Human dignity principle Participation principle Empowerment principle Responsibility principle	Efficiency principle Sufficiency principle User pays principle	Democracy principle Effective governance principle Corporate responsibility principle Global principle Practicality principle
MEASUREMENT THEMES <sup>1</sup>	<b>Atmosphere</b> Climate change Ozone layer depletion Air quality <b>Land</b> Agriculture Forests Desertification Urbanization Groundwater <b>Oceans, Seas, and Coasts</b> Coastal zone Fisheries <b>Fresh-Water</b> Water quality Water quantity <b>Biodiversity</b> Ecosystems Species Alien species <b>Pollution</b> Acidification Toxic contamination	<b>Equity</b> Poverty Gender equality <b>Health</b> Nutritional status Mortality Sanitation Drinking water Healthcare delivery Lifestyles and illnesses Pollution related illnesses <b>Education</b> Education level Literacy <b>Housing</b> Living conditions <b>Security</b> Crime <b>Population</b> Population change <b>Culture</b> Ethnic minorities Cultural heritage Participation in arts and recreation <b>Employment</b> Unemployment levels	<b>Economic Structure</b> Economic performance Trade Financial status <b>Consumption and Production Patterns</b> Material consumption Energy use Waste generation / management Transportation Tourism	<b>Institutional Framework</b> Strategic implementation of sust. dev. International cooperation <b>Institutional Capacity</b> Information access Communication and infrastructure Science and technology Disaster preparedness and response <b>Private sector responsiveness</b> Environmental management systems
APPLICATIONS	Environmental law EIA Ecological footprinting	Environmental education SIA HDI	BCA MCDA GDP	LCA SEA TBL reporting

1. Based on Table 1 and 2 from Hass, Brunvoll & Hoie (2002) and ESI2009 (South Africa, 2009)

## APPENDIX G

## ENVIRONMENTAL SUSTAINABILITY INDICATORS FROM ESI2009 (South Africa, 2009)

	Indicator number	Indicator	Variable number	Variable description
Environmental systems	1	Air quality	1	Domestic fuel burning
	2	Biodiversity	2	Threatened bird, mammal, amphibian and reptile species (known)
			3	Threat and protection status of vegetation types per biome
	3	Land	4	Degraded and transformed land
	4	Marine	5	Status of west coast rock lobster
			6	Catches of selected marine species (harvesting)
			7	Marine protected areas
	5	Freshwater	8	Available water per capita
			9	Capacity and levels of dams in South Africa
			10	Freshwater quality
			11	Groundwater quantity
	6	Groundwater	12	Groundwater quality
13			Air pollution	
Reducing environmental stress	7	Air pollution	14	Vehicles in use per populated area
	8	Ecosystem stress	15	Invasion of alien species
			16	Percentage change in projected population, 1950-2050
	9	Population pressure	17	Total fertility rate (TFR)
			18	Migration
			19	Ecological footprint
	10	Waste and consumption pressures	20	Energy use
			21	Grazing capacity
			22	Fertilizer sales
			23	Water stress
11	Water stress	24	Households with access to sanitation	
		25	Access to water	
Reducing human vulnerability	12	Basic human sustenance	26	Access to refuse removal
			27	Death rate from respiratory diseases and tuberculosis
			28	HIV prevalence
	13	Environmental health	29	Malaria
			30	Under 5 mortality
Social and institutional capacity	14	Eco efficiency	31	Energy efficiency
			32	Hydropower and renewable energy production as percentage of total energy consumption
	15	Environmental governance	33	Percentage of total land area under protected status
	16	Private sector responsiveness	34	Percentage of variables missing from the "Rio to Joburg Dashboard"
			35	Environmental management systems
	17	Science and technology	36	Budget for the environment
			37	Digital access index
			38	Number of researchers per 1 000 total employment
			39	Budget for research and development (R&D)
			40	Gross tertiary enrolment rate
41			Education (primary, secondary and adult basic education and training)	
Global stewardship	18	Greenhouse gas emissions	42	Carbon emissions per capita
			43	Multilateral environmental agreements
	19	Participation in international collaborative efforts	44	Production and consumption of CFCs
			45	Transfrontier conservation areas (TECAs)
20	Reducing transboundary environmental pressures			

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**APPENDIX H1**  
**THE MAIN STRATEGIC ELEMENTS OF THE NFSD, THE NSSD AND THE NSSD1**

<b>NATIONAL FRAMEWORK FOR SUSTAINABLE DEVELOPMENT (NFSD)</b> <b>(South Africa, 2008: 32-43)</b>	
<b>STRATEGIC FOCUS AREAS</b>	<b>INTERVENTIONS AND ACTIONS</b>
<b>1. Enhancing systems for integrated planning and implementation</b>	<ul style="list-style-type: none"> <li>• Governance and integration for sustainable development</li> <li>• Planning for sustainable development</li> <li>• Monitoring and evaluation for sustainable development</li> <li>• Policy integration</li> </ul>
<b>2. Sustaining our ecosystems and using natural resources efficiently</b>	<ul style="list-style-type: none"> <li>• Value of our ecosystems</li> <li>• Improving aquatic ecosystems, water availability and water quality</li> <li>• Investing in protecting and enhancing ecosystem services</li> <li>• Dematerialising the economy</li> <li>• Air quality</li> <li>• Energy efficiency</li> <li>• Food security and natural resource-based livelihoods</li> <li>• Economic and fiscal instruments</li> <li>• Implementation of international agreements</li> </ul>
<b>3. Economic development via investing in sustainable infrastructure</b>	<ul style="list-style-type: none"> <li>• Increasing investment in infrastructure to address poverty and unemployment</li> <li>• Mechanisms, methods and criteria to promote sustainable infrastructural investment</li> <li>• Developing skills and capacity for building and maintaining sustainable infrastructure</li> <li>• Second economy interventions</li> </ul>
<b>4. Creating sustainable human settlements</b>	<ul style="list-style-type: none"> <li>• A shared approach to sustainable human settlements</li> <li>• HIV and AIDS and TB</li> <li>• Linking sustainable resource use, poverty eradication and LED</li> <li>• Safe and efficient public transport</li> <li>• Rural sustainable settlements</li> <li>• Waste management</li> </ul>
<b>5. Responding to emerging social, economic and environmental challenges</b>	<ul style="list-style-type: none"> <li>• Climate change</li> <li>• Rising energy prices</li> <li>• International cooperation for sustainable development</li> <li>• HIV and AIDS</li> </ul>

<b>NATIONAL STRATEGY AND ACTION PLAN FOR SUSTAINABLE DEVELOPMENT (DRAFT) (NSSD) (South Africa, 2010: 12-34)</b>	
<b>STRATEGY</b>	<b>ACTION PLAN</b>
<b>Elements and Strategic goals</b>	<b>Strategic priorities and Goals</b>
<p><b>Directing the development path towards sustainability:</b></p> <ul style="list-style-type: none"> <li>- Reduce resource use as well as the carbon intensity of the economy</li> <li>- Provide equal access to resources and a decent quality of life for all citizens</li> <li>- Effective integration of sustainability concerns into policies, planning and decision-making at all levels</li> </ul> <p><b>Changing behaviour, values and attitudes:</b></p> <ul style="list-style-type: none"> <li>- Develop and promote new social and economic goals based on sustainability</li> <li>- Promote environmentally responsible behaviour through incentives and disincentives</li> <li>- Build a recognition that socio-economic systems are dependent on and embedded within ecosystems</li> <li>- Increase understanding of the value of natural resources (ecosystem services) to human wellbeing.</li> </ul> <p><b>Restructuring the governance system and building capacity:</b></p> <ul style="list-style-type: none"> <li>- Ensure effective integration and collaboration across all functions and sectors within government</li> <li>- Demonstrate commitment in changing the development focus to one based on sustainable programmes</li> <li>- Adopt a long-term view to development planning that considers inter-generational equity</li> <li>- Adhere to and exercise principles of good and ethical governance</li> <li>- Monitor, evaluate and report performance and progress in respect of sustainability goals.</li> </ul>	<p><b>1. Responding appropriately to climate change:</b></p> <ul style="list-style-type: none"> <li>- Decreasing greenhouse gas emissions to levels required by science / in line with Cabinet approved targets</li> <li>- Reducing dependency on fossil fuels and enhancing security of electricity supply;</li> <li>- Building resilience to climate change in communities; and</li> <li>- Ensuring that ecosystem resilience is not disrupted.</li> </ul> <p><b>2. Towards a Green Economy:</b></p> <ul style="list-style-type: none"> <li>- Increasing the contribution of the Environmental Goods and Services Sector to employment and the GDP;</li> <li>- Reducing the resource intensity of the economy (including energy and carbon);</li> <li>- Promoting cleaner technologies and investing in sustainable infrastructure; and</li> <li>- Promoting sustainable livelihoods and building local economies.</li> </ul> <p><b>3. Creating sustainable human settlements:</b></p> <ul style="list-style-type: none"> <li>- Enhancing spatial planning to promote social cohesion and integration between communities as well as between communities and the natural environment;</li> <li>- Ensuring universal access to basic and community services;</li> <li>- Improving the standard / quality of housing and other structures to optimise resource (energy, water, building materials etc.) efficiency; and</li> <li>- Promoting self-sufficiency, food security and equitable access to natural resources that support livelihoods.</li> <li>- Improving equity, security and social cohesion</li> </ul> <p><b>4. Sustaining our ecosystems and using natural resources efficiently:</b></p> <ul style="list-style-type: none"> <li>- Managing the use of all natural resources to ensure their sustainability;</li> <li>- Protecting and restoring scarce and degraded natural resources;</li> <li>- Preventing the pollution of air, water and land resources so that community and ecosystem health is not adversely affected; and</li> <li>- Avoiding the irreversible loss and degradation of biodiversity (marine, terrestrial, aquatic ecosystems).</li> </ul> <p><b>5. Enhancing governance systems and capacity:</b></p> <ul style="list-style-type: none"> <li>- Establish a structure that has the power to ensure the integration of sustainability concerns into all policies, planning and decision-making at national, provincial and local levels;</li> <li>- Ensure that the national vision and strategic plan are based on sustainability principles and are informed by the NSSD;</li> <li>- Ensure effective collaboration and coordination of planning and implementation;</li> <li>- Establish a monitoring and evaluation system to facilitate ongoing assessment of progress towards sustainability - including a set of indicators - and which provide appropriate feedback for the adaptation of management interventions as necessary; and</li> <li>- Build capacity to enhance the effectiveness of government agencies and to empower communities.</li> </ul>

<b>NATIONAL STRATEGY FOR SUSTAINABLE DEVELOPMENT AND ACTION PLAN (NSSD1) (South Africa, 2011:7)</b>	
<b>GOALS</b>	
<ul style="list-style-type: none"> <li>– Develop and promote new social and economic goals based on ecological sustainability and build a culture that recognises that socioeconomic systems are dependent on and embedded in ecosystems</li> <li>– Increase awareness and understanding of the value of ecosystem services to human wellbeing</li> <li>– Ensure effective integration of sustainability principles into all policies, planning and decision-making at national, provincial and local levels</li> <li>– Ensure effective system-wide integration and collaboration across all functions and sectors</li> <li>– Monitor, evaluate and report performance and progress in respect of ecological sustainability in relation to socioeconomic goals</li> </ul>	
<b>STRATEGIC PRIORITIES and OBJECTIVES</b>	<b>GOALS</b>
<p><b>1. Enhancing systems for integrated planning and implementation</b></p> <ul style="list-style-type: none"> <li>– Enhance effective governance, and institutional structures and mechanisms to achieve sustainable development and meeting the Millennium Development Goals (MDG) and Johannesburg Plan of Implementation (JPOI) goals and targets</li> <li>– Strengthen monitoring and reporting for improved environmental performance by government and the private sector</li> </ul>	<ul style="list-style-type: none"> <li>– Ensure integration of sustainable development into the national vision and strategic planning processes of government</li> <li>– Establish a monitoring and evaluation system to facilitate the ongoing assessment of progress towards sustainability</li> <li>– Ensure effective planning and implementation of sustainable development</li> <li>– Build capacity to enhance the effectiveness of government agencies to empower communities</li> <li>– Enforce normative criteria (values, attitudes and aptitudes) as a suitable base for effective and efficient public service delivery to the public or communities</li> </ul>
<p><b>2. Sustaining our ecosystems and using natural resources efficiently</b></p> <ul style="list-style-type: none"> <li>– Value, protect and continually enhance environmental assets and natural resources</li> </ul>	<ul style="list-style-type: none"> <li>– Manage the use of all natural resources to ensure their sustainability</li> <li>– Protect and restore scarce and degraded natural resources</li> <li>– Prevent the pollution of air, water and land resources so that community and ecosystem health is not adversely affected</li> <li>– Avoid the irreversible loss and degradation of biodiversity (marine, terrestrial, aquatic ecosystems)</li> </ul>
<p><b>3. Towards a green economy</b></p> <ul style="list-style-type: none"> <li>– A just transition towards a resource-efficient, low- carbon and pro-employment growth path</li> </ul>	<ul style="list-style-type: none"> <li>– Provide support to the regulatory framework</li> <li>– Implement and upscale green economy programmes</li> <li>– Implement skills development, in particular the youth, in the green economy sector (green industries)</li> <li>– Use market-based instruments</li> <li>– Grow and strengthen a portfolio of niche high-potential science and technology capabilities, as well as actively facilitate the exploitation of both existing and new capabilities to support sustainable development priorities and green economy ambitions</li> <li>– Create investment and finance opportunities and financing instruments</li> <li>– Create and protect jobs</li> <li>– Implement Industrial Policy Action Plan</li> </ul>

STRATEGIC PRIORITIES and OBJECTIVES	GOALS
<p><b>4. Building sustainable communities</b></p> <ul style="list-style-type: none"> <li>– Create community awareness, participation and work together to protect their environment through changing the attitudes and behaviour in consuming resources sustainably and responsibly</li> <li>– Develop and support quality housing projects/programmes including building community self-sufficient farming strategies, indigenous knowledge, the sustainable production of herbs and traditional medicine, and businesses to secure societal equity and cohesion</li> </ul>	<ul style="list-style-type: none"> <li>– Enhance spatial planning to promote social cohesion and integration between communities, as well as between communities and the natural environment</li> <li>– Ensure universal access to basic and community services</li> <li>– Improve the quality of housing and other structures to optimise resource efficiency (energy, water, building materials, etc.)</li> <li>– Promote self-sufficiency, food security and equitable access to natural resources that support livelihoods</li> <li>– Improve equity, security and social cohesion</li> </ul>
<p><b>5. Responding effectively to climate change</b></p> <ul style="list-style-type: none"> <li>– A fair contribution to the global effort to achieve the stabilisation of greenhouse gas concentrations in the atmosphere at a level that prevents dangerous anthropogenic interference with the climate system</li> <li>– Effectively adapt to and manage unavoidable and potential damaging climate change impacts through interventions that build and sustain South Africa’s social, economic and environmental resilience and emergency response capacity</li> </ul>	<ul style="list-style-type: none"> <li>– Decrease greenhouse gas (GHG) emissions to levels required by science/in line with Cabinet-approved targets – with particular emphasis on the energy sector, which accounts for over 70% of South Africa’s emissions</li> <li>– Reduce dependency on fossil fuels and enhance security of electricity supply</li> <li>– Build resilience to climate change in communities</li> <li>– Ensure that ecosystem resilience is not disrupted</li> </ul>

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**APPENDIX H2**  
**THE NSSD1 STRATEGIC PRIORITIES AND HEADLINE INDICATORS**  
(South Africa. 2011: 15)

STRATEGIC PRIORITY	HEADLINE INDICATORS
1. Enhancing systems for integrated planning and implementation	<ul style="list-style-type: none"> <li>- Establish an effective National Committee on Sustainable Development (NCSD) [<i>established by March 2012</i>]</li> <li>- Number of government entities and private sector companies that report against sustainability indicators [King III sustainability reporting, Carbon Disclosure Project and Water Disclosure Project]</li> <li>- Number of community-based capacity building projects [begin measuring]</li> </ul>
2. Sustaining our ecosystems and using natural resources efficiently	<ul style="list-style-type: none"> <li>- Curtail water losses at water distribution systems to an average percentage reduction (saving) [from 30 to 15% by 2014]</li> <li>- Reduction (saving) of demand as determined in the reconciliation strategies for seven large water supply systems by 15% [assessment of water requirements and water monitoring systems implemented by 2014]</li> <li>- Increase the number of Blue Flag beaches [to above 29 beaches]</li> <li>- Rehabilitation of land affected by degradation [3.2 million ha by 2014]</li> <li>- Percentage of coastline with partial protection [from 12 to 14% by 2014]</li> <li>- Percentage of land mass protected (formal and informal) [from 6.1 to 9% by 2014]</li> </ul>
3. Towards a green economy	<ul style="list-style-type: none"> <li>- Progress on the implementation of the nine green economy programmes [impact on social (jobs), economic (industry development) and environmental (ecosystem) benefits by 2014]</li> <li>- Increase percentage (or amount) of financial resources ringfenced/streamlined and spent for green economy programmes [2010/11 amount – Industrial Development Corporation: R11.7 billion, Development Bank of South Africa: R25 billion, Private: &gt;R100 billion, National Treasury: R800 million]</li> <li>- Number of patents, prototypes, and technology demonstrators added to the intellectual property (IP) portfolio annually from funded or co-funded research programmes [<i>five additions to the IP portfolio – patents, patent applications, licences and trademarks – by March 2014</i>]</li> <li>- Share of GDP of the Environmental Goods and Services (EGS) Sector [3% of GDP by 2014]</li> </ul>
4. Building sustainable communities	<ul style="list-style-type: none"> <li>- Percentage of households with access to water [92 to 100%], sanitation [69 to 100%], refuse removal [64 to 75%] and electricity [81 to 92%] [by 2014]</li> <li>- Upgrading of 400 000 households in well-located informal settlements with access to basic services and secure tenure [<i>approximately 2 700 informal settlements are in good locations, ie located close to metropolitan areas and basic services, have high densities and, in 2008, housed approximately 1.2 million households</i>]</li> <li>- Increase in the South African Human Development Index (HDI) [2010 HDI: 0.597]</li> <li>- Gini coefficient (reduce income inequality) [2008: 0.66]</li> </ul>
5. Responding effectively to climate change	<ul style="list-style-type: none"> <li>- Greenhouse gas emissions (metric ton CO2 equivalent) [34% reduction below a business-as-usual baseline by 2020 and 42% by 2025]</li> <li>- Percentage of power generation that is renewable [10 000 GWh by 2014]</li> <li>- Climate change adaptation plans developed [12 sectors by 2012 (Biodiversity, Forestry, Water, Coastal Management, Agriculture, Health, Tourism, Land and Rural Development, Local Government, Fisheries, Human Settlements, Business/Insurance)]</li> </ul>

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**APPENDIX H3**  
**THE NATIONAL DEVELOPMENT PLAN CRITICAL ACTIONS AND THE**  
**MEDIUM TERM STRATEGIC FRAMEWORK STRATEGIC PRIORITIES**

<b>NDP CRITICAL ACTIONS</b> (South Africa, 2012: 34)	<b>MTSF STRATEGIC PRIORITIES</b> (South Africa, 2009a: 5-6)
1. A social compact to reduce poverty and inequality, and raise employment and investment.	1. Speed up economic growth and transform the economy to create decent work and sustainable livelihoods
2. A strategy to address poverty and its impacts by broadening access to employment, strengthening the social wage, improving public transport and raising rural incomes.	2. Massive programmes to build economic and social infrastructure
3. Steps by the state to professionalise the public service, strengthen accountability, improve coordination and prosecute corruption.	3. A comprehensive rural development strategy linked to land and agrarian reform and food security
4. Boost private investment in labour-intensive areas, competitiveness and exports, with adjustments to lower the risk of hiring younger workers.	4. Strengthen the skills and human resource base
5. An education accountability chain, with lines of responsibility from state to classroom.	5. Improve the health profile of society
6. Phase in national health insurance, with a focus on upgrading public health facilities, producing more health professionals and reducing the relative cost of private health care.	6. Intensify the fight against crime and corruption
7. Public infrastructure investment at 10 percent of gross domestic product (GDP), financed through tariffs, public-private partnerships, taxes and loans and focused on transport, energy and water.	7. Build cohesive, caring and sustainable communities
8. Interventions to ensure environmental sustainability and resilience to future shocks.	8. Pursue regional development, African advancement and enhanced international cooperation
9. New spatial norms and standards – densifying cities, improving transport, locating jobs where people live, upgrading informal settlements and fixing housing market gaps.	9. Sustainable resource management and use [based on implementation of the NFSD]
10. Reduce crime by strengthening criminal justice and improving community environments.	10. Build a developmental state, including improving of public services and strengthening democratic institutions.

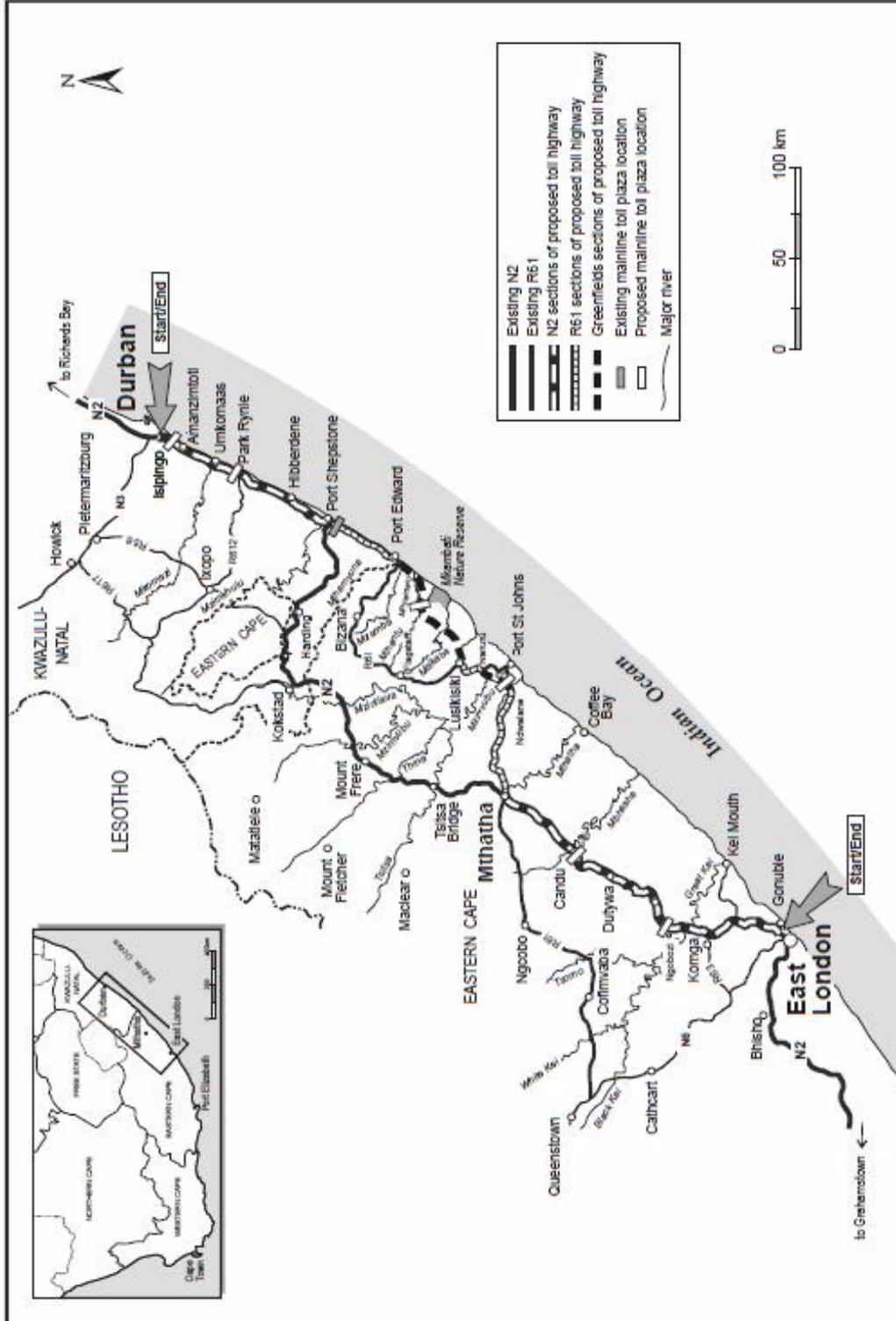
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**APPENDIX I**  
**SUSTAINABLE DEVELOPMENT STRATEGIES**

(An incomplete example based on the NSSD1 (South Africa, 2011))

KEY FOCUS AREA 1:	RESPONDING EFFECTIVELY TO CLIMATE CHANGE		
GOALS	INTERVENTIONS	INDICATORS:	TARGETS:
Decreasing greenhouse gas emissions	Introduction of an escalating CO <sub>2</sub> tax	Carbon emissions per capita	CO <sub>2</sub> emissions to peak between 2020-2025 and decline from 2035
	Introduction of mandatory standard	GHG intensity of electricity production	GHG intensity of 150 Mt CO <sub>2</sub> eq./MWh
Reducing dependency on fossil fuels	Incentives/subsidies for renewable energy technologies	Percentage energy from fossil fuels	Zero-carbon electricity by 2050
	Incentives/subsidies for renewable energy technologies	Renewable energy as % of total	15% of electricity from renewable sources by 2020
	Review biofuels strategy based on sustainability principles	Biofuels as % of transport liquid fuel use	Biofuels to contribute 2% of roads liquid transport fuel by 2013
	Investment in public transport systems	Number of commuters using public transport	City-wide public transport systems by 2020
Promote energy efficiency and conservation	Revised building standards		
	Promote solar water heating		
KEY FOCUS AREA 2:	GREENING THE ECONOMY		
GOALS	INTERVENTIONS	INDICATORS:	TARGETS:
Reducing resource intensity of the economy	Revise industrial policy to favour sectors using low energy and/or materials per unit of economic output	Energy consumption/ GDP	Overall energy demand reduction of 12% by 2015
Cleaner and more efficient production	Introduction of penalties	Percentage decrease in tonnage of industrial and mining waste	? percentage reduction
	Introduction of incentives	Percentage increase in tonnage of industrial and mining waste re-used	? percentage increase in recycling
	Sponsor research into alternatives	Tonnes of hazardous waste produced	? tonnage reduction

**APPENDIX J**  
**WILD COAST TOLL ROAD ROUTES**  
 (From CCA, 2007)



**Figure 1.1** The proposed N2 Wild Coast Toll Highway route between the Gonubie Interchange (Eastern Cape) and the Isipingo Interchange (KwaZulu-Natal)





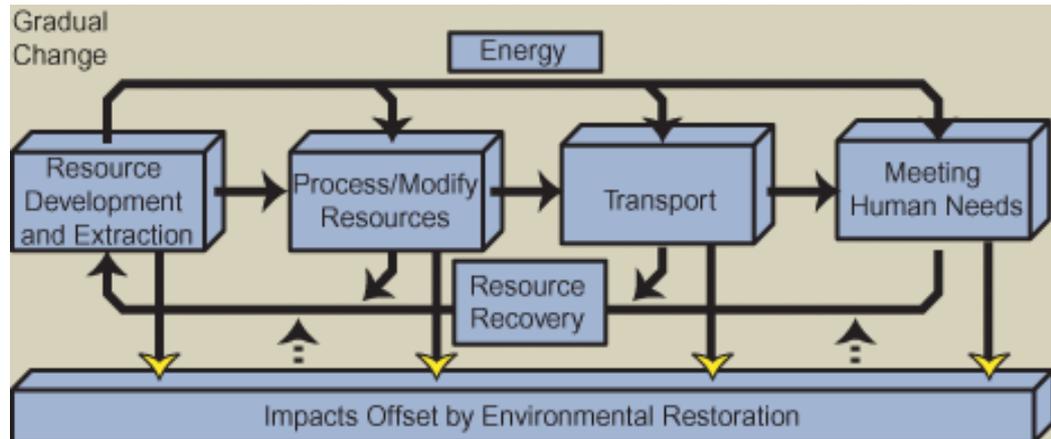
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## APPENDIX K

### ENGINEERING FOR SUSTAINABLE DEVELOPMENT

(From WFEO, 2002)

Engineers can play an important role in sustainable development by planning and building projects that preserve natural resources, are cost-efficient and support human and natural environments. A closed-loop human ecosystem can be used to illustrate the many activities of engineers that support sustainable development.



MODEL OF CLOSED-LOOP HUMAN ECO-SYSTEM

#### Resource Development and Extraction

Engineers are involved in developing and extracting natural resources in many different ways:

- Discovering and evaluating deposits of industrial minerals such as sand and gravel
- Planning open-pit and underground mining operations
- Petroleum engineering and designing off-shore oil platforms
- Water resource planning of all kinds including dams, irrigation systems and wells
- Agricultural engineering in land reclamation, drainage and improved farm operations
- Designing tree plantations and managing forests
- Designing fish farms and supporting aquaculture
- Improved land planning to protect the best farmland and natural resources from the impact of urban sprawl

#### Processing and Modifying Resources

In the past, many industries generated waste products that were toxic and not easily degraded under natural conditions. In the last 100 years, this has led to environmental pollution and new laws and regulations to help protect the environment. Because of improved measuring and monitoring technologies, pollution has been identified that was previously unknown. Many industries are now making major changes in the ways they use raw materials to produce products—by reducing their waste to a minimum, many are finding that improved processing leads to increased profits.

Engineers play the following roles in processing and modifying resources:

- Developing instrumentation to measure and monitor pollution
- Changing industrial processes to reduce the use of energy and other resources and to eliminate waste wherever possible
- Considering the total input/output of operations over their complete life-cycles

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- Designing products and packaging for re-use or resource recovery
- Collaborating with other industries by creating “eco parks” or applied industrial ecology. With this approach, several industries work together so that each industry’s waste products can be used as the raw materials for others. This also makes possible more efficient use of waste heating and cooling water and using combined waste treatment facilities.
- Restoring and modifying old industrial sites for other uses

### **Transportation**

In the past 200 years, engineers have made continuous breakthroughs in developing transportation systems:

- Building canals, locks and improving river navigation
- Designing and building all-weather roads and highways
- Constructing pipelines that move liquid and gas products
- Designing engines and transportation vehicles
- Building bridges and tunnels
- Constructing railroads and high-speed rail systems
- Creating ports and harbors
- Designing airplanes, airports and air traffic control systems

In the future, engineers will design these transportation systems so that they will:

- Be more energy efficient
- Create fewer adverse environmental impacts
- Encourage sound urban and rural planning with less urban sprawl
- Create longer-life facilities that can be maintained at lower costs

### **Meeting Consumer Needs**

By the year 2020, there may be 8 billion people in the world. Over 80 percent of this population will be in countries that we describe as “less developed” or “developing.” About half the world’s population lives in cities today; within 15 years, there may be more than 20 cities with populations of 10 million or more, and 500 cities will have more than a million inhabitants. In the next 25 years most of the population is expected to live in “mega-cities” in developing nations. The engineering profession will be under continuing pressure to help provide the food and other resources to this growing population, and the traditional roles of engineers will be stretched to satisfy the future needs of mega-cities.

The roles of engineers in meeting human needs include the following:

- Creative land planning and development to minimize negative environmental impacts
- In emerging mega-cities, helping to establish local organizations that can provide the necessary infrastructure
- Providing treatment facilities and distribution systems for potable water
- Designing systems to collect and store food and other supplies
- Designing housing and commercial buildings
- Developing streets, utility lines, public transportation and other infrastructure

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- Using underground space for recreation and other uses
- Providing technologies and facilities for heating and air conditioning
- Creating high-quality treatments for liquid and solid waste
- Reducing the risks of damage and loss of life from natural hazards such as hurricanes, floods and earthquakes

### **Resource Recovery and Reuse**

According to a World Resources Institute report, the USA currently produces more than 20 billion metric tons of materials per year, about 80 tons per person. The direct input into the built environment is over 3 billion metric tons. A high proportion of the materials used consists of industrial minerals such as sand, gravel and crushed stone.

In 1990 the average North American produced over 1500 pounds of municipal solid waste, compared to about 700 pounds by the average Western European. Eighty percent of all products in the USA are thrown away after one use. For sustainable development to be possible, our human activities will have to be redesigned to reuse our raw materials and consumer products many times over.

Engineers can assist in this process in several ways:

- Improving ways to recycle and reuse domestic waste
- Designing better solid waste collection and storage facilities
- Improving methods to collect and reuse construction materials such as concrete and asphalt from roads, and ways to reuse scrap metal and other natural and synthetic materials.
- Improving treatment facilities for urban organic waste and human waste so that the treated fluids and solids may be used safely for agriculture and other purposes.
- Recovering, reusing and remanufacturing byproducts from resource development and industrial processing

### **Environmental Restoration**

Some environmental pollution is inevitable in the future, resulting from resource extraction, industrial processing and transportation, and from wastes generated by humans wherever we live. In the future, the impacts of residual wastes should be offset by a variety of environmental restoration projects.

Engineers can assist in restoring environments in several ways:

- Treating and restoring old industrial waste sites
- Reclaiming old mine properties
- Treating polluted groundwater, lakes and streams
- Restoring the ecology of lakes and wetlands
- Renewing aging urban areas in large cities
- Reclaiming and restoring eroded or damaged farmlands

### **Energy Production and Use**

We now use 80 times more energy than we did in 1850, with attendant emissions of carbon, sulfur and nitrogen byproducts creating unacceptable levels of pollution. Humans consume more fossil fuels per year than nature produces in a million years. The long-term effects of increased energy use may produce major changes in the earth's climate.

The American Electric Power Research Institute (EPRI) has estimated that energy use in America could be reduced by 50% without any reduction in the country's standard of living. One of the greatest engineering challenges for the future will be to develop less environmentally damaging sources of energy while simultaneously reducing total energy consumption.

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In the future, the roles of engineers in energy production may include the following:

- More efficiently extracting and processing remaining petroleum and gas reserves
- Improving the efficiency of electric power stations and using superconductors for power distribution
- Reconsidering the use of nuclear power, assuming that safer facilities can be developed for generating power and handling nuclear wastes
- Expanding the use of hydroelectric, solar, geothermal, wind, and biomass energy

Engineers can also play a role in conserving and reducing the use of energy in the following ways:

- Designing energy-efficient buildings
- Designing industrial processes that are more energy efficient
- Using low-energy lighting systems
- Designing more efficient automobiles and public transportation systems
- Increasing the use of underground construction.

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## APPENDIX L

# THE CAMBRIDGE SUSTAINABLE FRAMEWORK FOR CIVIL ENGINEERS

(Based on Fenner, *et al.*, 2006 and Cruickshank & Fenner, 2007)

### 1. INTRODUCTION

Sustainable development could become a guiding concept for engineers in the 21st century. Ideally, the sustainable development concept can be used simply to help define a wider problem boundary than those limits traditionally adopted by engineers. This then leads to the creation of a wider design space in which more holistically conceived solutions can be formulated to any given problem.

A civil engineering project goes through three broad stages: defining the problem; choosing a solution; and implementing it through design, construction and operation. At the outset, *defining the problem* requires recognition that most engineering services needed by society are framed by the whole socio-economic-environmental reality. This is a complex adaptive system, with much that is hard to measure but nevertheless vitally important, and it needs to be embraced holistically. At the other end of the process, *design, construction and operation* require us to use our traditional deterministic mechanics and reductionist analytical techniques. These have proved highly appropriate over the last three centuries for providing safe, working solutions, and rely completely on measurement. In between, *choosing a solution* requires making the transition between these two different sciences. To achieve this, more options need to be considered and evaluated, and more choice criteria developed, than are often adopted using the traditional approach. Furthermore, several of these criteria will not be conveniently measurable. Engineers will be forced to acknowledge that we need to apply values, as well as mathematics, to the trade-offs or compromises involved in the decision. These also need to be transparent and accountable to a wide constituency of interested parties.

### 2. INCORPORATING SUSTAINABLE DEVELOPMENT

Whilst classical civil engineering activity has aimed at satisfying three overarching requirements, those of quality, cost and time, a wider framework is needed to help guide the engineer towards solutions that are more responsive to real needs, especially important in many development situations. This helps to define a new enlarged solution space which accepts, but goes beyond, considerations of economic profitability, market conditions, and competition as the drivers behind the choice of solutions. Such a framework, which attempts to encapsulate the sustainable development debate through encouraging engineers to work within a wider system boundary, is defined through the following elements (See Figure 1).

#### 2.1. Ethical foundation

This can provide the intellectual underpinning, and hence the justification for seeking a specific course of engineering action (or avoidance). It links the project proponents, the policy environment that relates to a project, the people affected by the project and the professional team involved. It encourages engineers to explore the justification for a scheme, and how it fits with the prevailing policy, end users and the environment

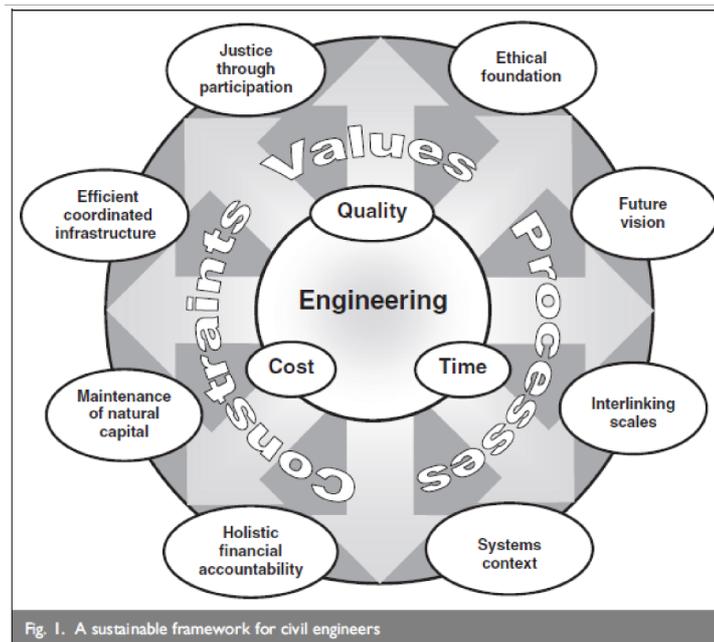
#### 2.2. Justice through participation

This covers the area of social equity, equal rights for development, democracy, public participation and empowerment. It also requires engineers to be scrupulous in terms of transparency and justification in decision-making. The social implications of development should be considered at the engineering design stage, taking into account any cultural, religious, ethnic or gender issues that might be relevant. The benefits for key recipients must be considered as well as ensuring that the effects are not over-damaging for the rest. Genuine concerns should be embraced through a willingness to adapt and modify designs, and a process of managing disagreements accepted by all parties.

### 2.3. Efficient provision and co-ordination of infrastructure

In consciously shaping the built environment, the engineer should be striving to create infrastructure that is ecologically acceptable, energy and resource efficient, and contributes to healthy, vibrant and cohesive living spaces. Engineering services such as transport systems, water and sanitation, communication networks, flood defences, buildings and other aspects of urban fabric impact on the lives of all those who live in towns and cities, sometimes with negative consequences (traffic congestion, pollution, visual impact, noise and wider system failures). Areas of good practice therefore include the use of alternative building materials, minimising waste, maximising energy efficiency, and facilitating recycling and material conservation.

### 2.4. Maintenance of natural capital



Engineers have developed powerful ways of altering and destroying natural capital. However, natural capital cannot be created at the rate at which it is likely to be depleted by industrialising activities. Therefore in terms of ecological economics, it should not be considered as substitutable by other forms of capital.

Whilst the need to maintain ecosystem diversity is important, it is not presented here as the sole or over-riding driver. Nevertheless opportunities should be sought throughout for enhancement as well as mitigation.

### 2.5. Holistic financial accountability

Engineers must adopt a transparency in their business practices and a willingness to accept that by-products of construction activities may affect the well-being of people or damage the environment. Those impacts should be reflected in market prices. Often the costs (or benefits) associated with externalities (e.g. the cost of natural resource depletion, pollution and other environmental and social factors) do not enter standard cost accounting schemes. It has been claimed that the image of construction within the public sector has been one of driving down initial capital costs, while longer term maintenance or energy costs have been 'worthy of just a passing glance at most'. Therefore a whole life appraisal should undertake a systematic assessment of all relevant expenses, income and performance associated with the acquisition, procurement, ownership and potential disposal of an asset over its life.

### 2.6. Systems context

Issues such as environmental degradation, poverty and economic success are fundamentally interlinked and can only be addressed through integrative management. The real world is complex, hierarchically structured and characterised by non-linear dynamics. Such inherent complexity leads to indeterminacy and uncertainty. The linear approach to procure, design, build, operate and decommission can lead to a failure to recognise the wider context in which engineering takes place as part of a series of complex systems, with feedback loops involving society and the environment.

### 2.7. Interlinking scales

Sustainable development can be viewed very differently from the perspective of individual life styles, or collectively at regional, national and global levels. Not only should distant spatial impacts be considered that may seem beyond the

perceived remit of the 'local' engineer, but inter-generational interests also need to be addressed and protected. It is the duty of the engineer to address aspects of a project that affect future generations and seek to develop designs and strategies in anticipation of their needs as well as those of the present. This raises the difficult question of where the boundary of an engineering project should be set and how far its influence should be considered.

### **2.8. Future vision**

It has been suggested that a sustainable world can never be fully realised until it is widely envisioned, whilst accepting that vision without action is useless and needs to be disciplined by scepticism. Vision is necessary to guide and motivate, and leads to a continuous need for re-invention of engineering practices and a challenging attitude towards traditional procedures, which may have been conceived within a much narrower framework, suitable for its time, but no longer capable of meeting modern challenges. This encourages the setting of ambitious goals and targets that stimulate creativity and innovation.

### **3. IMPLEMENTING SUSTAINABLE DEVELOPMENT—A QUESTIONING APPROACH**

The eight-point framework proposed here is derived from the current wide-ranging debates concerning the meaning of sustainable development. The eight points are useful in expanding the system boundaries within which engineers must operate and function, but they also present dangers in terms of losing focus and clarity of engineering responsibilities. To counter this a set of guiding questions have been formulated to enable practising engineers to be self-critical of their decisions. When these questions are thoroughly addressed they can be more searching and innovation-creative than higher level principles, while still being widely applicable. See table below.

Domain	Stage of project	Questions relevant to the domain	PSDF principles*
Ethical foundation	Defining the problem (scope)	How does the engineering project meet clearly defined needs of all project proponents and end users?	3.2
		When was the justification for the scheme or project explored? Has the way in which it fits within the prevailing government policy array been established?	5.2
		Where and with whom do the benefits of the scheme lie? Who wins and who loses?	3.1
		What clear responsibilities to both the client and to society/environment have been identified?	5.3
		In the absence of certainty and with incomplete information, are value judgements based on the precautionary principle?	2.3
		In extreme circumstances, is the option to say no retained, so an organisation (or individual) will not proceed with corrupt or dishonourable work?	5.3
		How has technical advocacy for pre-determined solutions been avoided?	5.2, 5.3
		How has the engineering process shown respect for people and the environment?	Many
		How do the drivers for the project match our ethics and values?	1.1, 1.2, 1.3
Justice through participation	Defining the problem (scope)	How has a fair foundation for this scheme been developed with the stakeholders?	3.1, 3.3
		Which cultural, religious, ethnic or gender issues may be relevant?	3.1, 3.4
		Have genuine concerns been considered with an openness and willingness to adapt and modify designs?	3.3
	Choosing a solution	How have the interests of those not well represented or not represented at all been recognised and embraced?	3.3, 3.4
		Implementation	What channels have been established for good communication with the public, employees and other professional groups? Is the basis of decision making established and known to all likely stakeholders at the outset?
	Implementation	With whom has the extent to which participation can and will affect decisions been determined and agreed? Who carries responsibility for explaining what cannot be altered, and why?	3.3, 5.2
	Implementation	What are the steps in the process for managing disagreement, and with whom are these discussed?	3.3, 5.2
	Implementation	Who is involved in establishing a base of agreed positions (facts as well as aspirations)?	3.3, 5.2

Domain	Stage of project	Questions relevant to the domain	PSDF principles*
Efficient healthy infrastructures	Choosing a solution	What opportunities for environmental enhancement (as well as mitigation) have been sought?	2.2, 2.4
		Are adverse impacts only accepted reluctantly?	2.4
	Implementation	At what stage is an appropriate balance between form and function of engineered systems explored and defined?	5.3
		What flexible and adaptable designs have been developed to allow for extended useful life?	5.5
		How much flexibility of operation can be permitted to allow for future change?	1.2, 5.3
		To what extent do designs contribute to social cohesion and inclusion, and human wellbeing and welfare?	3.2
		Does the engineering product provide value and satisfaction to meet the needs of end users and the general community?	5.3
		What safeguards ensure the performance of the scheme is taken into account over ALL its stages, including its design, construction, operation, decommissioning and disposal?	1.2, 5.3
		Have plans and proposals been prepared that reflect the true position and not an idealised one?	5.3
		How is the welfare of the workforce ensured and who has responsibility for highlighting safety issues?	5.2
		Have an extended range of options been examined? How have these been documented?	5.3
		Has the 'envelope' of constraints been set around an acceptable solution?	5.3
How do choice criteria required to evaluate decisions reflect sustainability issues?	5.3		
Maintaining natural capital	Choosing a solution	How is resource and energy efficiency optimised over the whole life of the project?	2.1, 4.1
		What steps are actively taken to minimise pollution arisings and negative visual impact?	2.4
	Implementation	How is careful and informed material selection ensured and over-specification avoided?	4.2
		What opportunities are sought for re-use (e.g. of land, materials and building stock)?	2.4
		Is a formal environmental management system adopted?	5.2
		To what extent is any natural capital lost as an integral part of the scheme sought to be replaced and replenished?	2,4

Domain	Stage of project	Questions relevant to the domain	PSDF principles*
		What distinction is made between actions that lead to large, irreversible and uncertain impacts (e.g. climate change) and smaller reversible ones (recognising not all impacts carry the same weight or significance)?	2.4
Holistic financial accountability	Choosing a solution	To what extent are transparent business practices audited externally and how is risk managed?	5.2
		How do costs reflect environmental and social externalities and at what intervals are these embraced and reported?	4.1
		What methods are used to assign other than monetary value to natural assets and social gain (by scoring qualitative components where feasible)?	4.1
		How are costs external to the scheme included in consideration of alternatives?	4.1
		What steps are taken to seek long-term relationships with clients and suppliers?	5.2
		How is it recognised that best value is not always lowest cost?	4.2
		Are costs minimised only where all costs over whole life are included?	4.1, 4.2
Systems context	Defining the problem (scope)	What agencies and other organisations are involved in adopting a co-ordinated approach to infrastructure provision?	5.2
	Choosing a solution	How is the relationship with other professional and special interest groups managed (e.g. planners, politicians, civil society, global corporations, individual stakeholders, etc.)?	5.2
		Who has responsibility for seeking integrative solutions (e.g. between hard (build) and soft (non-build) measures)?	5.2, 5.3
		How are impacts that go beyond the site boundary identified and what measurements are made?	2.4
		How is cradle to grave life cycle thinking adopted and a systems engineering approach followed?	2.4
		How is complexity recognised and uncertainty managed? Are the inter-relationships between system components understood?	1.2, 5.2

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Domain	Stage of project	Questions relevant to the domain	PSDF principles*
Interlinking scales	Defining the problem (scope)	Are global challenges appreciated and how do these influence the conception of local solutions (i.e. by acting as if local actions WILL have a wider influence)?	5.4
		Over what operational timescales are schemes considered and how is their influence on future generations provided for?	1.2
	Choosing a solution	How is the exploitation of distant resources and people minimised (e.g. by adopting fair trade practices)? How are the interests of communities beyond the immediate scope of the scheme considered?	1.2, 5.2
		At what stage are secondary (remote) impacts recognised in both space and time?	2.4
		What protocols exist for actively managing the supply chain?	5.2
Future vision	Defining the problem (scope)	How commonplace is it to take action BEFORE legislation and regulation requires change?	5.2
		What assumptions are made regarding increasing levels of regulatory control over emissions, waste, natural resources and increased costs and declining availability of energy?	5.2
	Choosing a solution	How are methods such as scenario planning used to explore a range of futures and to ensure real needs are served through careful problem formulation?	5,2, 5.3
		Implementation	What ambitious goals and targets are set that stimulate creativity and allow innovation? How regularly are they revised?
	Which long-term aims are considered as important drivers as responding to today's immediate problems?		1.2, 5.2
	How is performance benchmarked as a precursor to seeking continual improvement?		5.2
	What formal requirements are there to analyse past performance and learn and capture (tacit) experience?		5.2
	What mechanisms are used to encourage creativity and innovation?	5.2, 5.3	

\* Principles from the sustainable development framework proposed in this study - see Appendix C16

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**APPENDIX M1**  
**CODE OF ETHICS<sup>15</sup> - AMERICAN SOCIETY OF CIVIL ENGINEERS**  
(From ASCE, 2010a)

**Fundamental Principles<sup>16</sup>**

Engineers uphold and advance the integrity, honor and dignity of the engineering profession by:

- using their knowledge and skill for the enhancement of human welfare and the environment;
- being honest and impartial and serving with fidelity the public, their employers and clients;
- striving to increase the competence and prestige of the engineering profession; and
- supporting the professional and technical societies of their disciplines.

**Fundamental Canons**

1. Engineers shall hold paramount the safety, health and welfare of the public and shall strive to comply with the principles of sustainable development<sup>17</sup> in the performance of their professional duties.
2. Engineers shall perform services only in areas of their competence.
3. Engineers shall issue public statements only in an objective and truthful manner.
4. Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest.
5. Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.
6. Engineers shall act in such a manner as to uphold and enhance the honor, integrity, and dignity of the engineering profession and shall act with zero-tolerance for bribery, fraud, and corruption.
7. Engineers shall continue their professional development throughout their careers, and shall provide opportunities for the professional development of those engineers under their supervision.

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<sup>15</sup> The Society's Code of Ethics was adopted on September 2, 1914 and was most recently amended on July 23, 2006. Pursuant to the Society's Bylaws, it is the duty of every Society member to report promptly to the Committee on Professional Conduct any observed violation of the Code of Ethics.

<sup>16</sup> In April 1975, the ASCE Board of Direction adopted the fundamental principles of the Code of Ethics of Engineers as accepted by the Accreditation Board for Engineering and Technology, Inc. (ABET).

<sup>17</sup> In October 2009, the ASCE Board of Direction adopted the following definition of Sustainable Development: "Sustainable Development is the process of applying natural, human, and economic resources to enhance the safety, welfare, and quality of life for all of the society while maintaining the availability of the remaining natural resources."

## **Guidelines to Practice Under the Fundamental Canons of Ethics**

### **CANON 1.**

Engineers shall hold paramount the safety, health and welfare of the public and shall strive to comply with the principles of sustainable development in the performance of their professional duties.

- a. Engineers shall recognize that the lives, safety, health and welfare of the general public are dependent upon engineering judgments, decisions and practices incorporated into structures, machines, products, processes and devices.
- b. Engineers shall approve or seal only those design documents, reviewed or prepared by them, which are determined to be safe for public health and welfare in conformity with accepted engineering standards.
- c. Engineers whose professional judgment is overruled under circumstances where the safety, health and welfare of the public are endangered, or the principles of sustainable development ignored, shall inform their clients or employers of the possible consequences.
- d. Engineers who have knowledge or reason to believe that another person or firm may be in violation of any of the provisions of Canon 1 shall present such information to the proper authority in writing and shall cooperate with the proper authority in furnishing such further information or assistance as may be required.
- e. Engineers should seek opportunities to be of constructive service in civic affairs and work for the advancement of the safety, health and well-being of their communities, and the protection of the environment through the practice of sustainable development.
- f. Engineers should be committed to improving the environment by adherence to the principles of sustainable development so as to enhance the quality of life of the general public.

### **CANON 2.**

Engineers shall perform services only in areas of their competence.

- a. Engineers shall undertake to perform engineering assignments only when qualified by education or experience in the technical field of engineering involved.
- b. Engineers may accept an assignment requiring education or experience outside of their own fields of competence, provided their services are restricted to those phases of the project in which they are qualified. All other phases of such project shall be performed by qualified associates, consultants, or employees.
- c. Engineers shall not affix their signatures or seals to any engineering plan or document dealing with subject matter in which they lack competence by virtue of education or experience or to any such plan or document not reviewed or prepared under their supervisory control.

### **CANON 3.**

Engineers shall issue public statements only in an objective and truthful manner.

- a. Engineers should endeavor to extend the public knowledge of engineering and sustainable development, and shall not participate in the dissemination of untrue, unfair or exaggerated statements regarding engineering.
- b. Engineers shall be objective and truthful in professional reports, statements, or testimony. They shall include all relevant and pertinent information in such reports, statements, or testimony.
- c. Engineers, when serving as expert witnesses, shall express an engineering opinion only when it is founded upon adequate knowledge of the facts, upon a background of technical competence, and upon honest conviction.

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- d. Engineers shall issue no statements, criticisms, or arguments on engineering matters which are inspired or paid for by interested parties, unless they indicate on whose behalf the statements are made.
- e. Engineers shall be dignified and modest in explaining their work and merit, and will avoid any act tending to promote their own interests at the expense of the integrity, honor and dignity of the profession.

#### **CANON 4.**

Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest.

- a. Engineers shall avoid all known or potential conflicts of interest with their employers or clients and shall promptly inform their employers or clients of any business association, interests, or circumstances which could influence their judgment or the quality of their services.
- b. Engineers shall not accept compensation from more than one party for services on the same project, or for services pertaining to the same project, unless the circumstances are fully disclosed to and agreed to, by all interested parties.
- c. Engineers shall not solicit or accept gratuities, directly or indirectly, from contractors, their agents, or other parties dealing with their clients or employers in connection with work for which they are responsible.
- d. Engineers in public service as members, advisors, or employees of a governmental body or department shall not participate in considerations or actions with respect to services solicited or provided by them or their organization in private or public engineering practice.
- e. Engineers shall advise their employers or clients when, as a result of their studies, they believe a project will not be successful.
- f. Engineers shall not use confidential information coming to them in the course of their assignments as a means of making personal profit if such action is adverse to the interests of their clients, employers or the public.
- g. Engineers shall not accept professional employment outside of their regular work or interest without the knowledge of their employers.

#### **CANON 5.**

Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.

- a. Engineers shall not give, solicit or receive either directly or indirectly, any political contribution, gratuity, or unlawful consideration in order to secure work, exclusive of securing salaried positions through employment agencies.
- b. Engineers should negotiate contracts for professional services fairly and on the basis of demonstrated competence and qualifications for the type of professional service required.
- c. Engineers may request, propose or accept professional commissions on a contingent basis only under circumstances in which their professional judgments would not be compromised.
- d. Engineers shall not falsify or permit misrepresentation of their academic or professional qualifications or experience.
- e. Engineers shall give proper credit for engineering work to those to whom credit is due, and shall recognize the proprietary interests of others. Whenever possible, they shall name the person or persons who may be responsible for designs, inventions, writings or other accomplishments.
- f. Engineers may advertise professional services in a way that does not contain misleading language or is in any other manner derogatory to the dignity of the profession. Examples of permissible

advertising are as follows:

- Professional cards in recognized, dignified publications, and listings in rosters or directories published by responsible organizations, provided that the cards or listings are consistent in size and content and are in a section of the publication regularly devoted to such professional cards.
  - Brochures which factually describe experience, facilities, personnel and capacity to render service, providing they are not misleading with respect to the engineer's participation in projects described.
  - Display advertising in recognized dignified business and professional publications, providing it is factual and is not misleading with respect to the engineer's extent of participation in projects described.
  - A statement of the engineers' names or the name of the firm and statement of the type of service posted on projects for which they render services.
  - Preparation or authorization of descriptive articles for the lay or technical press, which are factual and dignified. Such articles shall not imply anything more than direct participation in the project described.
  - Permission by engineers for their names to be used in commercial advertisements, such as may be published by contractors, material suppliers, etc., only by means of a modest, dignified notation acknowledging the engineers' participation in the project described. Such permission shall not include public endorsement of proprietary products.
- g. Engineers shall not maliciously or falsely, directly or indirectly, injure the professional reputation, prospects, practice or employment of another engineer or indiscriminately criticize another's work.
- h. Engineers shall not use equipment, supplies, laboratory or office facilities of their employers to carry on outside private practice without the consent of their employers.

#### **CANON 6.**

Engineers shall act in such a manner as to uphold and enhance the honor, integrity, and dignity of the engineering profession and shall act with zerotolerance for bribery, fraud, and corruption.

- a. Engineers shall not knowingly engage in business or professional practices of a fraudulent, dishonest or unethical nature.
- b. Engineers shall be scrupulously honest in their control and spending of monies, and promote effective use of resources through open, honest and impartial service with fidelity to the public, employers, associates and clients.
- c. Engineers shall act with zero-tolerance for bribery, fraud, and corruption in all engineering or construction activities in which they are engaged.
- d. Engineers should be especially vigilant to maintain appropriate ethical behavior where payments of gratuities or bribes are institutionalized practices.
- e. Engineers should strive for transparency in the procurement and execution of projects. Transparency includes disclosure of names, addresses, purposes, and fees or commissions paid for all agents facilitating projects.
- f. Engineers should encourage the use of certifications specifying zerotolerance for bribery, fraud, and corruption in all contracts.

#### **CANON 7.**

Engineers shall continue their professional development throughout their careers, and shall provide opportunities for the professional development of those engineers under their supervision.

- a. Engineers should keep current in their specialty fields by engaging in professional practice,

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participating in continuing education courses, reading in the technical literature, and attending professional meetings and seminars.

- b. Engineers should encourage their engineering employees to become registered at the earliest possible date.
- c. Engineers should encourage engineering employees to attend and present papers at professional and technical society meetings.
- d. Engineers shall uphold the principle of mutually satisfying relationships between employers and employees with respect to terms of employment including professional grade descriptions, salary ranges, and fringe benefits.

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**APPENDIX M2**  
**THE WFEO MODEL CODE OF ETHICS**  
**ENVIRONMENTAL ENGINEERING ETHICS**

(From WFEO, 2001: 2 - 3)

Engineers, as they develop any professional activity, shall:

- try with the best of their ability, courage, enthusiasm and dedication, to obtain a superior technical achievement, which will contribute to and promote a healthy and agreeable surrounding for all people, in open spaces as well as indoors;
- strive to accomplish the beneficial objectives of their work with the lowest possible consumption of raw materials and energy and the lowest production of wastes and any kind of pollution;
- discuss in particular the consequences of their proposals and actions, direct or indirect, immediate or long term, upon the health of people, social equity and the local system of values;
- study thoroughly the environment that will be affected, assess all the impacts that might arise in the structure, dynamics and aesthetics of the ecosystems involved, urbanized or natural, as well as in the pertinent socioeconomic systems, and select the best alternative for development that is both environmentally sound and sustainable;
- promote a clear understanding of the actions required to restore and, if possible, to improve the environment that may be disturbed, and include them in their proposals;
- reject any kind of commitment that involves unfair damages for human surroundings and nature, and aim for the best possible technical, social, and political solution;
- be aware that the principles of eco-systemic interdependence, diversity maintenance, resource recovery and inter-relational harmony form the basis of humankind's continued existence and that each of these bases poses a threshold of sustainability that should not be exceeded.

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**APPENDIX M3**  
**THE ECUK PRINCIPLES TO GUIDE ENGINEERS**  
**COMPARED TO THE PRINCIPLES OF THE PSDF**

<b>PRINCIPLES TO GUIDE ENGINEERS</b> (ECUK, 2009)		<b>PSDF</b> (App C16)
<p><b>1. Contribute to building a sustainable society, present and future.</b>            Engineers have a responsibility to maximise the value of their activity towards building a sustainable world. This requires an understanding of what society demands and what is achievable, and a recognition that these change over time. They should:</p>	recognise that though their activity may be local and immediate, the potential impacts of their work may be global and long-lasting	§1.2
	have an understanding of other relevant social and cultural structures outside their own normal community of practice	§3.1
	understand the important potential role for engineers in the sustainable development of communities	*1
	recognise the impacts of an engineering project on communities, global or local, and consider the views of the community	§3.3 & §5.3
	understand the important potential role for engineers	*1
<p><b>2. Apply professional and responsible judgement and take a leadership role.</b>            Engineering is a profession with a strong ethical dimension, with engineers having an important role in providing solutions for issues such as poverty, under-development and environmental degradation. In making a sound judgement, the professional engineer should:</p>	look at the broad picture	§1.2
	ensure that their knowledge about sustainable development is up-to-date	§5.3
	be prepared to influence the decision-maker for a project	*1
	identify all the issues and options to the decision-maker for a project so that decisions are soundly based	§5.3
	identify options that take account of global, economic, social and environmental outcomes	§1.3
	ensure that solutions and options are offered that will contribute to sustainability	§5.3

<b>PRINCIPLES TO GUIDE ENGINEERS</b> (ECUK, 2009)		<b>PSDF</b> (App C16)
	be aware that there are inherently conflicting and un-measurable aspects of sustainability	*2
<b>3. Do more than just comply with legislation and codes.</b> In seeking sustainable solutions, complying with current legislation, codes and environmental protection regulations may not be sufficient and engineers should:	strive to go beyond the minimum wherever possible, anticipating future legislation which may be stronger	§5.3
	by their example, help others improve their performance	§5.3
	drive future legislation	§5.3
	alert the relevant authorities if there are deficiencies in legislation and if sustainable solutions and outcomes could be endangered by regulatory change	§5.3
	use their technical expertise to influence the development of new legislation and codes	§5.3
<b>4. Use resources efficiently and effectively.</b> Engineers have a stewardship role with respect to planetary resources, and a responsibility to society to create more useful products and services with the lowest possible consumption of raw materials, water and energy. This requires them to:	understand that there are environmental limits and finite resources	§2.1
	reduce resource demand by using less in the first place	§2.2 § 4.2
	reduce waste production by being efficient with resources that are used	§2.4
	use systems and products that reduce embedded carbon, energy and water use, waste and pollution	§2.4
	adopt full life cycle assessment as normal practice, including in the supply chain	§4.3
	adopt strategies for re-use, recycling, decommissioning and disposal of components and materials	§2.4
	minimise any adverse impacts on sustainability at the design stage	§5.3
	work to repair any damage	§2.4

<b>PRINCIPLES TO GUIDE ENGINEERS</b> (ECUK, 2009)		<b>PSDF</b> (App C16)
<b>5. Seek multiple views to solve sustainability challenges.</b> The increasing complexity of sustainability challenges means that engineers working alone cannot solve all the challenges that we face. It is important for engineers to be inclusive and:	engage with stakeholders, listening and recognising the value of the perspectives of others, including non-specialists	§3.3 & §5.3
	avoid working in isolation, involving other professionals at all stages of a project	§5.3
	utilise cross-disciplinary knowledge and diverse skills	§1.2 & §5.3
	promote the important leadership role of the engineer in finding solutions to sustainability challenges for the benefit of society	*1
	seek a balanced approach	§5.5
<b>6. Manage risk to minimise adverse impact to people or the environment.</b> Engineers are routinely involved in planning and managing projects, where they should:	harness their skills to minimise damage to people or the environment from engineering processes and products	§5.3
	undertake a comprehensive risk assessment before a project begins	*2
	ensure that the risk assessment includes the potential environmental, economic and social impacts, beyond the lifetime of the engineering project or product	§1.2 & §1.3
	recognise the potential long-term aspect of risk	§1.2
	give sustainability the benefit of any doubt, adopting a precautionary approach where scientific knowledge is not conclusive	§2.3
	instigate monitoring systems so that any environmental and social impacts of engineering projects are identified at an early stage	§5.3

\*1 & \*2: Further comment on these clauses to be found in §10.2.2.4.

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**APPENDIX M4**  
**THE EA ENVIRONMENTAL PRINCIPLES FOR ENGINEERS**  
**COMPARED TO THE PRINCIPLES OF THE PSDF**

<b>ENVIRONMENTAL PRINCIPLES FOR ENGINEERS</b> (IEA, 1992: 1-3)	<b>PSDF*</b> (App C16)
<b>1 Engineers Need to Develop and Promote a Sustainability Ethic, and:</b>	
1.1 Recognise that ecosystem interdependence and diversity form the basis for our continued existence.	1.2
1.2 Recognise the finite capacity of the environment to assimilate human made changes.	2.1
1.3 Recognise the rights of future generations. No generation should increase its wealth to the detriment of others.	1.2; 3.1
1.4 Promote a clear understanding of the actions required in engineering practice to improve, sustain, and restore the environment.	2.2
1.5 Promote the development of alternatives to the use of non-renewable resources.	2.1
1.6 Promote the wise use of non-renewable resources through waste minimisation and recycling, wherever possible in engineering activities	2.1; 2.4
1.7 Strive to achieve the beneficial objectives of engineering work with the lowest possible consumption of raw materials and energy, and by adopting sustainable management practices.	2.4
<b>2 Engineers Need to Recognise the Interdisciplinary Nature of Engineering, and:</b>	(1.2)
2.1 Recognise that the expertise required for carrying out a specific engineering activity may not be sufficient for judging the environmental implications of that activity.	
2.2 Involve other environmentally-based disciplines in determining the environmental implications of engineering activities.	(1.2; 5.3)
2.3 Recognise individual limitations in assessing environmental effects, and respect other professional opinions.	
<b>3 Engineers Should Practice Engineering in Accord with a Sustainability Ethic that leads to Sustainable Development, and:</b>	(1.3)
3.1 Study thoroughly the environment that will be affected, assess all the impacts that may arise, and select the best alternative for an environmentally sound and sustainable project.	(5.3)

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<p style="text-align: center;"><b>ENVIRONMENTAL PRINCIPLES FOR ENGINEERS</b> (IEA, 1992: 1-3)</p>	<p style="text-align: center;"><b>PSDF*</b> (App C16)</p>
3.2 Urge clients or employers to incorporate environmental objectives into design criteria, and to prevent or minimise the adverse environmental effects of engineering activities.	
3.3 Include consideration of environmental effects at all phases of planning and implementation of engineering activities.	(1.2)
3.4 Consider the consequences of all proposals and actions, direct or indirect, immediate or long term, upon cultural heritage, social stability, health of people, and equity.	(1.2)
3.5 Identify and act to minimise potential environmental effects of engineering activities.	2.4
3.6 Rigorously examine the basic functions and purposes behind a project to recognise options and alternatives to improve sustainability.	(5.3)
3.7 Inform clients that engineers can reduce but not always eliminate adverse environmental impacts without incurring increased costs. This does not imply that increasing the cost will solve all environmental problems.	
3.8 Suggest alternatives to clients if the proposed engineering activity is likely to create unavoidable environmental risks.	
3.9 Urge clients to incorporate monitoring of environmental change into projects, and to adjust operations as a result of monitoring.	
3.10 Include costs and benefits relating to environmental quality and degradation in economic evaluations of engineering activities.	4.1
3.11 Recognise the rights of the community to be involved in project formulation and development and actively encourage such involvement.	3.3
<p><b>4 Engineers Should Act with Integrity, Objectively and Ethically, remembering their Responsibility to the Community, and:</b></p>	5.3
4.1 Recognise all actual, potential or perceived conflicts of interest in relation to engineering activities.	(5.3)
4.2 Recognise that compromising environmental quality or standards in engineering activities is an inappropriate means of reducing cost. This approach may only achieve short term gains at the expense of long term sustainability.	
4.3 Provide information to clients, employers, the public and government about ways of improving the sustainability of engineering activities.	(5.3)

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<p style="text-align: center;"><b>ENVIRONMENTAL PRINCIPLES FOR ENGINEERS</b> (IEA, 1992: 1-3)</p>	<p style="text-align: center;"><b>PSDF*</b> (App C16)</p>
4.4 Disclose environmental implications and external costs of engineering activities, taking into account the often inadequate and uncertain nature of environmental data.	(5.3)
4.5 Report on environmental issues with honesty and integrity.	(5.3)
4.6 Decline to be associated with engineering activities if the client or employer is unwilling to support adequate efforts to evaluate environmental issues or to mitigate environmental problems.	
<b>5 Engineers Should Pursue and Encourage Professional Development, and:</b>	(5.3)
5.1 Keep informed on global environmental trends and issues.	(5.3)
5.2 Actively support and participate in environmental education.	5.3
5.3 Maintain dialogue about sustainable development with other professions.	(5.3)
5.4 Learn the skills necessary to develop active community participation in engineering activities.	(3.3; 5.3)
5.5 Assist and advise other engineers where necessary in the application and use of the principles of sustainable development identified in this document.	(5.3)

\*The corresponding principle numbers in this column are indicated without brackets - direct correlation; or with brackets - indirect correlation.

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**APPENDIX M5**  
**THE IPENZ SUSTAINABILITY PRINCIPLES AND GUIDELINES<sup>18</sup>**  
**COMPARED TO THE PRINCIPLES OF THE PSDF**  
 (Coates, et al., 2004 & Appendix C16)

<b>IPENZ PRINCIPLES</b>	<b>IPENZ GUIDELINES</b>	<b>PSDF</b>
Principle 1: Maintaining the viability of the planet	1. Humans need to <b>maintain the integrity of global and local biophysical systems</b> to ensure that the irreplaceable life support functions upon which human well-being depends are retained.	2.1
	2. Non-renewable resource <b>depletion rates shall equal the rate at which renewable substitutes are developed</b> by human invention and investment.	2.1
	3. Renewable resources must be managed to <b>ensure that they can be produced over the long term within sustainable harvest rates</b> (i.e. that do not exceed the regenerative capacity of the natural system that produces them), and without long term damage to the environment.	2.1
	4. Technological options selected for engineered products, processes or systems, shall be <b>weighted in favour of choices that, for a given expenditure, minimise the use of resources</b> , particularly non-renewable resources such as fossil fuel-based energy and metals. They should also be based on the precautionary principle and reduce risks as much as practicable or foreseeable.	2.1
	5. The <b>material and energy intensity of engineered products, processes or systems needs to be reduced significantly</b> (10 to 50 times), and the efficiency of those that use energy must be improved to achieve sustainability. To achieve this requires the use of recycling and other resource reuse and minimisation techniques.	2.1
	6. All <b>waste streams from the life cycle of engineered products, processes or systems shall be minimised</b> , preferably at the source. Waste discharges should be kept within the assimilative capacity of the local and global environments.	2.4
	7. The <b>use and production of environmentally hazardous materials shall be minimised</b> and, wherever possible, eliminated. In particular, the use of materials and chemicals that accumulate in the environment needs to be reduced to a level that does not exceed acceptable or natural levels.	2.4

<sup>18</sup> As formulated by the presidential task committee of IPENZ

IPENZ PRINCIPLES	IPENZ GUIDELINES	PSDF
Principle 2: Providing for equity within and between generations.	8. Humans, now and in the future <b>shall have equal rights to achieve an acceptable quality of life</b> . They shall have choices in life that reduce significant gaps in health, security, social recognition, political influence, etc. between people.	3.1
	9. <b>Consumption of resources needs to be balanced</b> between the affluent and those yet to fulfil their basic needs, while ensuring total resource use is within the environment's sustainable capacity.	4.2
	10. Resource use and development must be <b>considered over a sufficiently long time scale that future generations are not disadvantaged</b> economically, socially or environmentally by present actions.	1.2
	11. Those directly affected by engineering projects, products, processes or systems <b>need to be consulted and given the opportunity to voice concerns without repercussions</b> . Their views shall be incorporated into the planning and decision making process.	3.3
Principle 3: Solving problems holistically.	12. Problem solutions shall be <b>appropriate and based primarily on human needs and ecosystem viability</b> rather than the availability of a particular technology.	2.1, 3.2, 5.2, 5.3
	13. Solutions to issues of <b>growth in demand shall involve its realistic assessment and management</b> , rather than merely predicting and providing the means for meeting growth targets.	4.1, 5.2, 5.3
	14. A holistic, <b>systems-based approach shall be used to solve problems</b> rather than focussing on technology alone.	1.2, 5.2, 5.3
	15. Methods shall be implemented that provide solutions with <b>optimum outcomes for all stakeholders</b> , rather than expedient or narrowly focussed solutions.	3.1, 5.2, 5.3
	16. The use of unsustainable practices, or <b>practices that present a risk to sustainability shall be minimised</b> and reduced to zero over time. Where it is practicable or desirable, past degradation shall be reversed.	1.2, 1.3, 5.2, 5.3
	17. Problem <b>solutions shall be based on prudent risk management approaches</b> , and not by solving one problem at the expense of, or by creating another problem.	1.2, 5.2, 5.3

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**APPENDIX M6**  
**THE FIDIC ‘SUSTAINABILITY PRINCIPLES’<sup>19</sup>**  
**COMPARED TO THE PRINCIPLES OF THE PSDF**  
(FIDIC, 2002a: 31 & Appendix C16)

<b>FIDIC</b>	<b>PSDF</b>
<b>Environmental Dimension</b>	
Increase material efficiency by reducing the material demand of non-renewable goods.	2.1
Reduce the material intensity via substitution technologies.	2.1
Enhance material recyclability.	2.4
Reduce and control the use and dispersion of toxic materials.	2.4
Reduce the energy used to transform goods and supply services.	2.4
Support the instruments of international conventions.	5.4
Maximise the sustainable use of biological and renewable resources.	2.1
Consider the impact of planned projects on air, soil, water, flora and fauna.	2.1, 2.2 & 2.4
<b>Economic Dimension</b>	
Consider life-cycle costs.	4.1
Internalise external costs.	4.1
Consider alternative financing mechanisms.	(5.2 & 5.3)
Develop economic instruments to promote sustainable consumption.	4.1
Consider the economic impact on local structures.	(4.3)
<b>Social Dimension</b>	
Enhance a participatory approach by involving stakeholders.	3.3 & 5.2
Promote public participation.	3.3
Promote appropriate institutional frameworks.	5.1, 5.2 & 5.3
Consider the influence on existing social frameworks.	3.1 & 3.2
Assess the impact on health and the quality of life.	3.2

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<sup>19</sup> Called knowledge-based intellectual sustainability services by FIDIC

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## APPENDIX M7 THE SAICE CODE OF ETHICS

Extract from Constitution Bylaws, 2005 edition. (SAICE, 2005b: 1-3)

### Preamble

- 1.1.1 Civil engineering is the application of science and technology in the control and use of forces and materials of nature, for the progressive benefit of all the peoples on planet Earth. Construction is an essential human activity that rivals few in its consumption of resources and its potential to harm the Earth. Many decisions have environmental and ecological consequences, which may not immediately affect any of the primary actors in a project, but which still require wise ethical judgment. Codes of conduct established by the Built Environment Councils regulate the behavior of professionals. They do not inculcate a value system within which choices between rival goods or ills can be made. A code of ethics is therefore required to provide a framework within which decisions between alternative courses of action can be made.
- 1.1.2 SAICE members, who are professionally registered, are bound to abide by the codes of conduct, which regulate their registration and may be disciplined should they fail to do so. The SAICE code of ethics is, however, necessary to provide a framework within which decisions between alternative courses of actions should be taken. Ethical judgment is needed to maintain the stability of our society without the undue imposition of formal regulations for every act.
- 1.1.3 Ethical decisions are not just decisions about the best way to meet a given brief or objective, but are concerned with:
- the quality of our decisions;
  - justice;
  - equity;
  - the consequences of all affected by the decision;
  - the personal and collective responsibilities which lie beyond the contractual obligations entered into;
  - the “good” and the “right”; and
  - conflicts between rival goods or ills;

### Ethical Values

- 1.2.1 Members must discharge their professional responsibilities with integrity and not undertake work in areas in which they are not competent to perform.
- 1.2.2 Members must protect life and the environment and safeguard people.
- 1.2.3 Members must manage the Earth’s resources in a sustainable manner by minimizing the adverse environmental impacts of their civil engineering works and technologies for both present and future generations.
- 1.2.4 Members must where possible, promote socio-economic development through their engineering works or application of technology that leads to a higher quality of life for the current generation, without compromising future generations.
- 1.2.5 Members must endeavor to deliver cost effective solutions in a manner consistent with

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safety and other aspects of public interest.

- 1.2.6 Members must actively contribute to the well-being of society and, when involved in any civil engineering project or application of technology, where appropriate, recognize the need to identify, inform and consult affected parties.
- 1.2.7 Members must not agree to or comply with any instructions requiring dishonest action or the disregard of established norms of safety or levels of risk in design and construction.
- 1.2.8 Members must continue the development of their own and the profession's knowledge, skill and expertise in the art and science of civil engineering and technology, and share and exchange advances for the benefit of society.
- 1.2.9 Members must understand and comply with the laws of the communities within which they practise and with international law.
- 1.2.10 Members must continuously seek to promote and support the concept of creating value to society as a whole.

### **Guidelines**

- 1.3.1 Members should act with integrity and fairness.
- 1.3.2 Members should have regard for the public interest and for the interests of all those affected by their professional activities.
- 1.3.3 Members should maintain and broaden their competence, and assist others to do so.
- 1.3.4 Members should exercise appropriate skill and judgement.
- 1.3.5 Members should avoid conflict of interests.
- 1.3.6 Members should adopt a balanced, disciplined and comprehensive approach to problem solving.
- 1.3.7 Members should apply skill, judgement and initiative to contribute positively to the well-being of society.
- 1.3.8 Members should ensure that systematic reviews are undertaken of all aspects of a project that impact upon the environment, including the justification for the need of the project and economic, social and political factors in order to minimize any adverse effects.
- 1.3.9 Members should treat people with dignity and have consideration for the values and cultural sensitivities of all groups within the community who could be affected by their work.
- 1.3.10 Members should endeavor to be fully informed about relevant public bodies, community needs, and perceptions, which may affect their work.

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- 1.3.11 Members should not allow the serving of a client's or community's needs to take precedence over the needs of the wider society.
- 1.3.12 Members should take reasonable steps to minimize the risk of the loss of life, injury or suffering which may result from their work or the effects of their work and to point out the level and significance of risk associated with their work to those affected.
- 1.3.13 Members should ensure, where engineering decisions, recommendations or opinions are ignored or rejected, that those affected are made aware of the possible consequences.
- 1.3.14 Members should accept personal responsibility for work done by or under their supervision or direction and take reasonable steps to ensure that anyone working under their authority is both competent to carry out the assigned tasks and likewise accepts personal responsibility.
- 1.3.15 Members should not misrepresent their areas or levels of experience and responsibility.
- 1.3.16 Members should be committed to the efficient use of resources.
- 1.3.17 Members should minimize the generation of waste and encourage environmentally sound re-use, recycling and disposal.
- 1.3.18 Members should seek and encourage excellence in their own and others' practice of the art and science of civil engineering and technology.
- 1.3.19 Members should contribute to the collective wisdom of the profession and the art of civil engineering and technology in which they practice.
- 1.3.20 Members should seek solutions that are compatible with the principles of sustainable development, particularly those that relate to social development and poverty relief.
- 1.3.21 Members should take reasonable care to ensure the quality, safety and sustainability of the work entrusted to them.
- 1.3.22 Members should report any situation concerning the safety of the public or the degradation of the environment, that they become aware of and that is considered to be an unreasonable risk, to the appropriate organization or authority.
- 1.3.23 Members should expose unprofessional or dishonest conduct through the appropriate channels.
- 1.3.24 Members should reject any principle, proposal, action or thing, which may prejudice independent and impartial judgment.

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## **APPENDIX N SUSTAINABILITY CHARTER FOR ENGINEERS**

### **PREAMBLE**

The world is facing wide spread environmental and social problems, which can only be addressed holistically through the process of sustainable development. Thus it is necessary for sustainable development to become the primary instrument of policy. The objective of sustainable development is to transform society so that it lives in harmony with the environment while meeting the needs of both present and future generations.

### **ENGINEERS AND SUSTAINABLE DEVELOPMENT**

Engineering projects, broadly understood, are unrivalled in terms of their impact on society and the environment.

- Hence it is of critical importance that engineers adopt sustainable development as a fundamental tenet of their practice.
- Because of their position as technical agents engineers will often be cast in leadership roles with respect to sustainable development. Hence
  - they need to be aware of their own individual and their profession's limitations in addressing sustainability issues
  - they need to recognise the multi-disciplinary nature of sustainability solutions
  - they need to advocate sustainability to government, society, clients and colleagues, and be firm in their rejection non-sustainable approaches
- It would be inappropriate for engineers to compete for commissions on the basis of lowered commitments to sustainable development. If clients cannot accept these commitments their commissions may have to be declined.
- In order to fulfil their role in all of the above engineers have to adopt the vision, the values and the principles of the sustainable development framework given here below as fundamental to their practice. It follows that engineers have to exhibit honesty and integrity in all their dealings with their clients, the authorities, fellow engineers and members of the public.

### **SUSTAINABLE DEVELOPMENT FRAMEWORK**

The sustainable development frame work consists of vision, values, foundational principles and then subsidiary principles in each of the following dimensions: environmental; social, economic and institutional.

## **VISION**

A sustainable society is one that maximises the well-being of its members while living in harmony with its environment

## **VALUES**

Reverence for life, beneficence, fairness

## **THE FOUNDATIONAL PRINCIPLES**

### **The respect for life principle**

The founding ethic of sustainable development is respect and care for the community of life.

### **The holism principle**

The interconnectedness of everything is fundamental to sustainable development. It is expressed, inter alia, through:

- the interdependence of life
- inter-generational concern
- long-term thinking
- softening of spatial boundaries
- broad-based education
- multi-disciplinary practice
- integrated planning.

### **The sustainability principle**

Development is only sustainable if capacity is created to secure the integrated realisation of the following objectives:

- environmental integrity
- social cohesion
- economic vitality.

## **THE SUBSIDIARY PRINCIPLES: ENVIRONMENTAL DIMENSION**

### **The carrying capacity principle**

Natural resource use must be contained to be within the environmental regenerative and absorptive capacities of the earth. This requires the

- use of renewable resources not to exceed the regenerative capacity of the environment
- minimisation and the eventual substitution of non-renewable resource use
- minimisation of waste generation to within the assimilation capacity of the environment.

### **The conservation principle**

Nature is of value, both to humans and in and of itself. To protect nature and natural systems a culture of conservation needs to be nurtured. This will include:

- the conservation of biodiversity
- the conservation of natural life support systems
- the conservation of areas natural uniqueness and beauty
- the restoration of damaged natural systems
- being respectful of nature.

### **The precautionary principle**

Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty

shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

### **The minimum impact principle**

The ubiquitous human impact on the natural environment requires inter alia that:

- pollution and degradation of the environment be avoided, or, where it cannot be avoided, it be minimised and remedied
- the production of waste be avoided, or where it cannot be avoided, it be minimised and reused or recycled where possible, and otherwise disposed of in a responsible manner
- negative impacts on the environment be anticipated and prevented, and where they cannot be prevented, they be minimised and remedied.

### **The anti-cruelty principle**

No animal should wilfully and arbitrarily be subjected to cruelty.

## **THE SUBSIDIARY PRINCIPLES: SOCIAL DIMENSION**

### **The fairness principle**

All humans are entitled to fairness in their interactions with each other. This includes:

- recognition of their human rights
- recognition of their cultural rights
- recognition of their environmental rights
- equity in access to resources, opportunities and information for the present and future generations
- freedom from discrimination based on prejudice
- freedom from persecution and oppression
- spiritual and religious freedom.

### **The human dignity principle**

All humans are entitled to have their basic needs met such that their human dignity is not impaired.

These needs include:

- food
- shelter
- health
- security
- family bonds
- education
- employment
- respite from poverty.

### **The participation principle**

Humans are entitled to participate in decisions which affect their lives, and to this end effective communication and knowledge transfer are prerequisites.

### **The empowerment principle**

All disadvantaged groups need to be empowered so that they may participate effectively in societal processes, and also so that they may enjoy full access to the available societal and environmental benefits. These groups include

- women
- the young

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- the old
- indigenous peoples
- racial groups.

### **The responsibility principle**

All humans and societies have a common but differentiated responsibility to ensure that all their activities contribute towards sustainability.

## **THE SUBSIDIARY PRINCIPLES: ECONOMIC DIMENSION**

### **The efficiency principle**

This principle requires that all resources be used as efficiently as possible. This requires progressive and innovative economic systems that recognise:

- the value of market forces
- the value of full property rights
- the need for the inclusion of externalities
- the limitations of resource substitution.

### **The sufficiency principle**

While meeting at least the minimum needs of all in society, consumption levels and wealth differentials should be limited by considerations of sustainability and equity.

### **The user pays principle**

Whoever receives the benefits from environmental resources or services needs to bear the cost. This requires the internalisation of externalities and the application of life cycle analyses. It also implies, in the case of pollution, the cost of the avoidance and treatment thereof, and compensation for those who suffer the negative consequences of such activities.

## **THE SUBSIDIARY PRINCIPLES: INSTITUTIONAL DIMENSION**

### **The democracy principle**

Governments need to create conditions amenable to sustainable development. These include, *inter alia*:

- being representative
- being accountable
- allowing maximum individual freedom
- guaranteeing the other rights as outlined in these principles
- guaranteeing public institutional capacity to carry out these principles
- guaranteeing the rule of law
- combatting crime effectively.

### **The effective governance principle**

Public institutions need to provide conditions which enable the implementation of all the sustainable development principles. This requires *inter alia*:

- the pursuit of excellence
- administrative competence and justice
- transparency around processes, assumptions, uncertainties, etc.
- accountability (no corruption)
- a national framework of integrated laws, policies and standards
- co-ordination between the various levels of government
- fair employment practices
- prior and continuing assessment and improvement

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- consideration of alternatives
- community engagement
- devolved decision-making
- conflict management
- population control and management of urbanisation
- environmental education
- application of sound science, with recognition of innovation and traditional knowledge
- use of low impact and appropriate technology
- technical adequacy
- networking with other bodies and institutions.

### **The corporate responsibility principle**

Businesses and organisations are required to conduct their operations so as to promote the objectives of sustainable development. This requires adherence to, as appropriate, the conditions as listed under the effective governance principle, and a pro-active stance on all matters dealing with sustainability.

### **The global principle**

The global nature of many environmental issues requires of governments, multi-national companies and international organisations to promote sustainable development through inter alia:

- international co-operation based on the recognition of national sovereignty as well as global responsibilities
- adherence to international law and treaties
- liaison between all role players
- global commons obligations
- consideration and limitation of trans-boundary harm
- recognition of North vs South disparities and obligations
- international peace.

### **The practicality principle**

In order to respond expeditiously to environmental and social challenges sustainable development approaches need to be based on:

- an explicit framework that links vision, values and principles to indicators and assessment criteria
- a limited number of key issues for analysis
- standardising wherever possible
- a pluralistic approach
- awareness that there are inherently conflicting and un-measurable aspects of sustainability
- assessment of the risk involved.

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**APPENDIX 01**

**UNDERGRADUATE UNIVERSITY PROGRAMMES IN CIVIL ENGINEERING CURRENTLY ACCREDITED BY ECSA**

YEAR	UCT <sup>1</sup>		UKZN <sup>2</sup>		UP <sup>3</sup>	
<b>1st</b>	Chemistry for Engineers Engineering Engineering Mathematics Engineering Statics Engineering Physics		Engineering Drawing Introduction to Civil Design Tech. Comm. for Engineers Intro. to Engineering Materials	Chemistry for Engineers Mathematics (Eng) Applied Mathematics Engineering Physics Engineering Practice Workshop	Graphical Communication Calculus General Chemistry Materials Science <b>Humanities &amp; Soc Sciences</b>	Linear Algebra Physics Mechanics Electricity and Electronics Workshop Practice
<b>2nd</b>	Mechanics of Materials Structural Engineering Spatial Data Acquisition & Man Civil Engineering Camp Experimental Methods & Stats Geotechnical Engineering	Fluid Mechanics Geology for Engineers Vector Calculus for Engineers Linear Algebra and DEs for Engs Materials Science in Engineering	Civil Engineering Materials Fluids Structures Surveying (Engineering) Structural Design	Mathematics (Eng) Elements of Geology for Civil Eng. Electives Materials workshop	Calculus Differential Equations Strength of Materials Prof and Tech Communication Geomaterials and Processes Surveying <b>Community-based Proj</b>	Mathematics Numerical Methods Structural Analysis Pavement Materials and Design Engineering Statistics Civ Eng Measurement Techniques
<b>3rd</b>	Structural Engineering Geotechnical Engineering Hydraulic Engineering Engineering	Hydrology Transportation Planning Water Treatment Urban Water Services Economics for Engineers <b>Elective</b>	Fluids Structural Design Geotech. Engineering Studies Structures Transport Mathematical Systems	Engineering Statistics Elective Civil CADD workshop	Hydraulics Structural Analysis Civil Engineering Economics Program and Info Technology Soil Mechanics	Timber Design Geotechnical Engineering Civil Building Materials Steel Design Reinforced Concrete Design Transportation Engineering
<b>4th</b>	Structural Engineering Design Project <b>Professional Practice</b> Waste Water Treatment	Urban Design & Management Research Project <b>Intro to Environmental Assess &amp; Man</b>	Water & Environmental Eng. Civil Engineering Design Project Ground & Structural Engineering Dissertation	<b>Transport &amp; Env Management</b> Mgmt. of Construction Contracts Professional Practice <b>Electives</b> Practical Vacation Work	Hydraulics Research Project Steel Design Reinforced Concrete Design Infrastructure Planning Engineering Professionalism	Practical Training <b>Environmental Geotechnology</b> Civil Eng Constr Management Design Concept Detailed Design Public Presentation

YEAR	UJ <sup>4</sup>		US <sup>5</sup>		WITS <sup>6</sup>	
1st	Applied Mathematics Introduction to Engineering Design Mathematics	Chemistry Electrotechnics Graphical Communication	Language Skills Engineering Mathematics Applied Mathematics Engineering Chemistry	Professional Communication Computer Programming Electro-Techniques	Chemistry Engineering Computing Engineering Skills Mathematics	<b>Critical Thinking and Philos Reasoning</b> Physics Mechanics
2nd	Applied Mathematics Mathematics Applied Mechanics Concrete Technology Statistics for Engineers	Science of Materials Fluid Mechanics Strength of Materials Modelling	Applied Mathematics Engineering Geology Engineering Mathematics Strength of Materials	Land Surveying Building Materials Engineering Informatics Vacation Training	Earth Materials and Processes Engineering Planning and Design <b>Intro to Env Eng, Health and Safety</b> Economics and Management	Materials and Structures Numerical Methods Prob Theory and Math Statistics for Eng.s Mathematics Engineering Surveying Practical Training (Civil) Vacation Work (Civil)
3rd	Geotechnical Engineering Structural Engineering Hydraulic Engineering Geology <b>Environmental Man for Engineers</b> Communication	<b>Heritage Assessment</b> Transportation Engineering Project Management Surveying Urban Development Studies	Engineering Informatics Engineering Statistics Hydraulics Geotechnique	Theory of Structures Structural Design Transportation Vacation Training	Construction Materials Geotechnical Engineering Structural Steel Design Reinforced Concrete Design Hydrology Basic Hydraulics	Structural Engineering Infrastructure Planning and Management Systems Analysis and Optimisation Vacation Work (Civil)
4th	Geotechnical Engineering Civil Design Project Management Civil Project Investigation Structural Engineering Civil Prof Practice	Urban Hydraulics Legal Applications in Engineering Practice Urban Development Studies	<b>Philosophy and Ethics</b> Hydrology Project Management Structural Design Transportation Hydraulic Engineering	Advanced Design (Civil) Engineering Management <b>Environmental Engineering</b> Project (Civil Engineering)	Construction Materials Structural Engineering Civil Engineering Design Geotechnical Engineering	Investigational Project <b>Integrated Resource Management</b> Hydraulic Engineering

Notes

For reasons of simplification designations such as I, II, 1A, 1B, etc. have been omitted, and semester modules of the same subject indicated only once.

Sustainability/environmental offerings have been printed in bold.

1. Handbook 2013: Faculty of Engineering & the Built Environment (Undergraduate) 2013, University of Cape Town.
2. Handbook for 2013. College of Agriculture, Engineering and Science. University of KwaZulu-Natal.
3. Yearbook 2013: Faculty of Engineering, Built Environment and Information Technology. University of Pretoria.
4. Undergraduate Yearbook 2013. Faculty of Engineering and the Built Environment. University of Johannesburg.
5. Calendar 2013, Part 11: Faculty of Engineering. Stellenbosch University.
6. Rules and Syllabuses, 2013: Faculty of Engineering & the Built Environment. University of the Witwatersrand

APPENDIX O2

UNDERGRADUATE UNIVERSITY PROGRAMMES IN ENVIRONMENTAL ENGINEERING

YEAR	Griffith <sup>1</sup>		Monash <sup>2</sup>		PET Proposal <sup>3</sup>	
1st	<b>Engineering Practice and Sustainability</b> Mathematics Physics General Chemistry	Computing and Program with MATLAB Statics and Materials Earth Science and GIS	<b>Conservation biology Environmental engineering</b> Process systems analysis Engineering structures Computing for engineers	Mathematics for engineering Chemistry - principles and practice* Physics, energy and the environment*	Mathematics Surveying Drawing Applied Mechanics Construction Materials Computer Skills I Surveying(Civil) Theory of Structures Construction Methods	Communication Skills Management(Civil) <b>Social Env Studies</b> ○ (a) <b>Social Theory</b> (b) <b>Development</b> (c) <b>Env Ethics</b> (d) <b>Env Issues</b> (e) <b>Env Economics</b> (f) <b>Env Pol &amp; Law</b>
2nd	Mathematics Engineering Fluid Mechanics <b>Env Economics and Policy</b> <b>Env Microbiology and Ecology</b>	Engineering Design Fundamentals Hydrology Engineering Thermodynamics Numerical and Data Analysis	<b>Environmental policy and management Ecology and biodiversity</b> Material and energy balances Thermodynamics Water systems	Transport and traffic engineering Materials properties and recycling Advanced engineering mathematics	Management (Civil) Transport Engineering Geotechnical Engineering R/Concrete & Masonry Structural Analysis Water Engineering Documentation Transport Engineering	Geotechnical Engineering Steel & Timber Design Structural Analysis <b>Env Engineering (Civil)</b> (a) <b>Env Chemistry</b> (b) <b>Ecology</b> (c) <b>Env Microbiology</b> (d) <b>Env Engineering</b>
3rd	Water and Wastewater Treatment Solid Waste Engineering <b>Environmental Assessment*</b> <b>Cleaner Production and Eco-efficiency*</b> Project Management Principles	<b>Environmental Eng Design Project Ecological Theory and Practice*</b> <b>Resolving Env Issues*</b> Overseas Experience Program	Groundwater and env geoengineering Urban water and wastewater systems <b>Energy and the environment The air environment Env impact assessment and managm systems</b>	Project management for civil engineers† Computer and water systems modelling†† Engineering investigations††	Hydraulics Water Treatment Technology <b>Air Pollution Engineering Practice</b>	Waste Water Treatment Technology <b>Solid Waste Management Soil &amp; Groundwater Pollution</b>
4th	Industry Affiliates Program Industry Experience <b>System Design Project Site Remediation and Rehabilitation*</b>	<b>Env Management Systems*</b> <b>Hazardous Waste Management*</b>	<b>Prosperity, poverty and sustainability in a globalised world Sustainability &amp; the law Environmental risk assessment Environmental design† Environmental project†</b>	Ground hazards and env geotechnics†† Integrated urban water management†† Water resources management††	Hydrology <b>Water Resources Management (Civil)</b> Reticulation Design & Management <b>Env. Research Methodology</b>	Project Management Urban Planning & Design <b>Environmental Man. for Eng. (Civil)</b> <b>Env Research Project</b>

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Notes

For reasons of simplification designations such as I, II, 1A, 1B, etc. have been omitted, and semester modules of the same subject indicated only once.

Sustainability/environmental offerings have been printed in bold.

\* These subjects are examples of electives that could be chosen from a given list. In some cases free choice electives are also possible.

† These subjects are prescribed for the *Water and land management* stream, which has been chosen for this example. There are two other alternative streams: *Environmental process engineering* and *Transport and the built environment*.

†† These subjects are example electives for the *Water and land management* stream.

1. Program details: Environmental Engineering. Griffith University. Available at <http://www148.griffith.edu.au/programs-courses/Program/CourseListAndRequirements?programCode=1311&studentType=Domestic>. [Accessed on 26 February 2013].
2. Handbook 2013: Engineering. Monash University. Available at <http://www.monash.edu.au/pubs/2013handbooks/courses/1253.html> [Accessed on 26 February 2013].
3. Long S. S. (2001). The introduction of environmental engineering at the Port Elizabeth Technikon, An unpublished report.

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**APPENDIX P**  
**COMPARISON BETWEEN THE *DECLARATION OF BARCELONA* AND**  
**THE PSDF**

Declaration of Barcelona (EESD, 2004)	PSDF Principles
<b>Today's engineers must be able to:</b>	
Understand how their work interacts with society and the environment, locally and globally, in order to identify potential challenges, risks and impacts.	1.2; 1.3; 5.4
Understand the contribution of their work in different cultural, social and political contexts and take those differences into account.	3.1; 3.2; 5.1
Work in multidisciplinary teams, in order to adapt current technology to the demands imposed by sustainable lifestyles, resource efficiency, pollution prevention and waste management.	1.2; 2.1; 2.4
Apply a holistic and systemic approach to solving problems and the ability to move beyond the tradition of breaking reality down into disconnected parts.	1.2
Participate actively in the discussion and definition of economic, social and technological policies, to help redirect society towards more sustainable development.	1.3; 5.2; 5.3
Apply professional knowledge according to deontological principles and universal values and ethics.	PSDF values
Listen closely to the demands of citizens and other stakeholders and let them have a say in the development of new technologies and infrastructures.	3.3; 5.3
<b>Engineering education, with the support of the university community as well as the wider engineering and science community, must:</b>	
Have an integrated approach to knowledge, attitudes, skills and values in teaching.	1.2
Incorporate disciplines of the social sciences and humanities.	1.3; 3.1-5
Promote multidisciplinary teamwork.	1.2
Stimulate creativity and critical thinking.	*
Foster reflection and self-learning.	*
Strengthen systemic thinking and a holistic approach.	1.2
Train people who are motivated to participate and who are able to take responsible decisions.	3.5; 5.3
Raise awareness for the challenges posed by globalisation.	5.4
<b>In order to achieve the above, the following aspects of the educational process must be reviewed:</b>	
The links between all the different levels of the educational system	n/a
The content of courses.	n/a
Teaching strategies in the classroom.	n/a
Teaching and learning techniques.	n/a
Research methods.	n/a
Training of trainers.	n/a

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Declaration of Barcelona (EESD, 2004)	PSDF Principles
Evaluation and assessment techniques.	n/a
The participation of external bodies in developing and evaluating the curriculum.,	n/a
Quality control systems.	n/a
<p><b>These aspects cannot be reviewed in isolation. They need to be supported by an institutional commitment and all decision makers, in the form of:</b></p> <p>A redefinition of institutions' and universities' missions, so that they are adapted to new requirements in which sustainability is a leading concern.</p>	n/a
An institutional commitment to quality.	n/a
An institutional support for changing educational paradigms and objectives research funding.	n/a

\* While these objectives are not implicit in the PSDF, a strong argument can be made that they are implied in its rationale.

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