Alternative Sources of Finance for Sustainable Development in South Africa with Specific Reference to Carbon Trading

by
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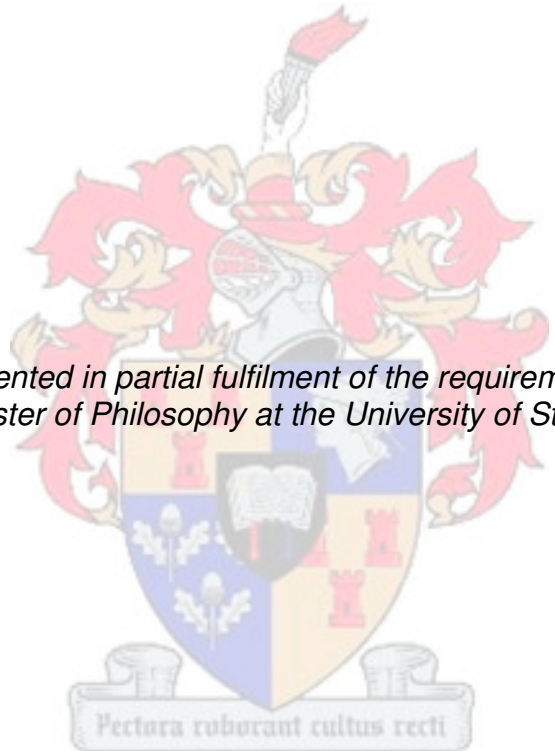

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DECLARATION

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ABSTRACT

The world has been engaged in a global 'development project' since the late 1940s. This process gained new momentum with the end of colonialism and the emergence of newly independent countries, all of them plagued with high levels of poverty. Traditional models of economic growth based on industrialisation and import-substitution did not deliver the expected results to reduce poverty, especially in Africa. New ways of engaging with development emerged; in particular the basic needs approach in the 1970s and later the human development approach.

Independently a new environmental movement surfaced in the 1960s, responding to the rallying call of global environmental destruction as a result of economic activities. For the first time a global language on the limitations nature presents to development emerged. The 'movement' received particular traction with the emergence of global climate disruption as the single largest global environmental issue. 'Human needs', represented by the anthropocentrists, and 'environmental limitations', represented by environmentalists were merged in an uncomfortable union to give birth to the notion of sustainable development. Yet, as a result of a large variety of perspectives, no agreement has been reached on what sustainable development means or should achieve.

There is agreement though that developmental needs and environmental challenges are both urgent. An important unanswered question is how the world will pay for sustainable development interventions. Some interesting ideas on alternative sources of development finance has been around for a while, yet has not found practical application. Carbon finance, an innovative new source of funding, is an exception.

This exploratory research was conducted by reviewing existing relevant literature using the inductive logic technique. It was initiated as a result of specific experiences leading the researcher to some general 'truths'.

The findings revealed that carbon markets, which are primarily focussed on reducing carbon emissions and which in itself makes a positive contribution to sustainability, has over the last few years successfully leveraged billions of dollars for investment in sustainable development projects globally. Some of these have the added advantage of co-benefits for the poor. Its role is set to

expand as a source of development finance. South Africa has the potential to earn large amounts from carbon trading, assisting the country to move to a more sustainable development trajectory. The findings concluded that realising this potential will require a more focussed approach, especially from the South African Government.

SAMEVATTING

Die wêreld is sedert die 1940s besig met ‘n grootskaalse ‘ontwikkelingsprojek’. Die proses het nuwe momentum gekry teen die einde van die koloniale tydperk. Die nuut onafhanklike state het almal gebuk gegaan onder hoë vlakke van armoede. Tradisionele modelle van ekonomiese groei gebasseer op industrialisasie en invoer vervanging, het nie die verwagte resultate in terme van armoede verligting - veral in Afrika - gehad nie. Nuwe benaderings tot ontwikkeling - spesifiek die ‘basiese behoeftesbenadering’ in die 1970s en later die menslike ontwikkelingsbenadering – is ontwikkel met die hoop dat dit beter resultate sal lewer om armoede hok te slaan.

Terselfdertyd het ‘n nuwe omgewingsbeweging in die 1960s ontstaan, in reaksie op die vernietig van die natuur deur die mens se ekonomiese aktiwiteite. Die gevolg was dat daar ‘n internasionale taal onstaan het wat die beperkinge wat die natuur op ontwikkeling plaas kon verwoord. Dit het veral momentum gekry met die bewuswording dat aardverwarming die wêreld se grootste omgewingsuitdaging bied. Mense se behoeftes soos verwoord deur antroposentriste, en omgewingsbeperkings soos verwoord deur omgewingskundiges, het bymekaargekom om die nuwe konsep van volhoubare ontwikkeling te vorm. As gevolg van ‘n groot verskeidenheid van interpretasies is daar geen ooreenstemming oor wat volhoubare ontwikkeling beteken of behoort te bereik nie.

Waaroor daar wel ooreenstemming is, is die feit dat die wêreld se behoefte aan ontwikkeling sowel as die omgewingsuitdagings beide dringend is. ‘n Belangrike vraag wat niemand nog kon beantwoord nie, is hoe die wêreld gaan betaal vir volhoubare ontwikkelingsprojekte. Alhoewel daar ‘n paar kreatiewe idees vir alternatiewe bronne van ontwikkelingsfinansiering die rondte doen, het nog nie een daarvan praktiese beslag gekry nie. Die enigste vindingryke nuwe bron van ontwikkelingsfinansiering wat wel geïmplimenteer is, is koolstof finansiering.

Dié ondersoekende navorsing is gedoen deur middel van ‘n literatuur studie van bestaande relevante materiaal, deur gebruik te maak van die induktiewe logika tegniek. Die studie is geïnisieer as gevolg van spesifieke ondervindings wat die navorser gelei het na algemene ‘waarhede’.

Bevindinge uit die studie het aangedui dat koolstof markte, wat primêr ten doel het om die vrystel van aardverwarmingsgasse te beperk en dus opsigself ‘n positiewe bydrae tot volhoubaarheid lewer, oor die laaste paar jaar daarin geslaag het om miljarde dollars beskikbaar te maak vir volhoubare ontwikkelingsprojekte wêreldwyd. Sommige hiervan het die voordeel dat dit arm gemeenskappe bevoordeel. Die rol van die koolstofmarkte gaan in die toekoms toeneem. Suid Afrika het die potensiaal om groot bedrae te verdien uit koolstof finansiering, wat die land behoort te help om op ‘n meer volhoubare ontwikkelingspad voort te gaan. Die bevindinge sluit af deur aan te dui dat die realisering van dié potensiaal ‘n baie meer gefokusde benadering deur veral die Suid Afrikaanse Regering gaan vereis.

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LIST OF ABBREVIATIONS

AAU	|	Assigned Amount Unit
CCX	|	Chicago Climate Exchange
CDM	|	Clean Development Mechanism
CEF	|	Central Energy Fund
CER	|	Certified Emissions Reductions
CO_2	|	Carbon Dioxide
CO_2e	|	Carbon Dioxide Equivalent
COP	|	Conference of the Parties
DAC	|	Development Assistance Committee
DfNSs	|	Debt-for-Nature Swaps
DNA	|	Designated National Authority
DOE	|	Designated Operational Entity
EBCDM	|	Executive Board of the Clean Development Mechanism
EFA-FTI	|	Education for All Fast Track Initiative
ERUs	|	Emissions Reduction Units
EU	|	European Union
EU-ETS	|	European Union Emission Trading Scheme
EUA	|	European Union Allowances
FDI	|	Foreign Direct Investment
G-20	|	Twenty Largest Economies
GAVI	|	Global Alliance for Vaccines and Immunisation
GDI	|	Gender-Related Development Index
GDP	|	Gross Domestic Product
GEF	|	Global Environmental Facility
GEM	|	Gender Empowerment Measure
GFATM	|	Global Fund to Fight AIDS, Tuberculosis and Malaria
GHG	|	Greenhouse Gas
GNI	|	Gross National Income

GNP	|	Gross National Product
GWP	|	Global Warming Potential
HDI	|	Human Development Index
HFC_{23}	|	Hydroflorocarbons
HIPC	|	Heavily Indebted Poor Countries
HPI	|	Human Poverty Index
ILO	|	International Labour Organisation
IMF	|	International Monetary Fund
IPCC	|	Intergovernmental Panel on Climate Change
JI	|	Joint Implementation
LULUCF	|	Land-Use, Land-Use Change and Forestry
MAC	|	Marginal Abatement Cost
MDGs	|	Millennium Development Goals
MDRI	|	Multilateral Debt Relief Initiative
Mt	|	Million Tons
NGO	|	Non-Governmental Organisation
N_2O	|	Nitrogen Oxide
OBA	|	Output-Based Aid
ODA	|	Official Development Aid
OECD	|	Organisation for Economic Cooperation and Development
OTC	|	Over the Counter
pCDM	|	Programmatic CDM
PDD	|	Project Design Document
PIN	|	Project Identification Note
PPM	|	Parts Per Million
REC	|	Renewable Energy Certificate
SCC	|	Social Cost of Carbon
SDR	|	Special Drawing Rights
SO_2	|	Sulphur Dioxide

SWAPs	|	Sector Wide Approaches
tCO_2	|	Metric Tons of Carbon Dioxide
tCO_2e	|	Metric Tons of Carbon Dioxide Equivalent
UN	|	United Nations
UNDP	|	United Nations Development Programme
UNEP	|	United Nations Environmental Programme
UNFCCC	|	United Nations Framework Convention on Climate Change
US	|	United States
USAID	|	United States Agency for International Development
VER	|	Verified Emissions Reduction

1.1. INTRODUCTION

After decades spent searching for creative and innovative ways in which to improve the quality of life of all, while at the same time trying to protect the environment, it may be time to be brutally honest: it seems like we are losing this battle on all fronts.

The needs of the poor seem to mount. More and more people, especially in Sub-Saharan Africa either experience no improvement or a real deterioration in their quality of life. Access to nutrition, clean water, health care and shelter seems to be getting more precarious. On every 'development' indicator, African countries invariably occupy the bottom places. While only 15% of the developing world population live in Africa, it is home to approximately a third of those living on less than $1 per day; many living on much less. The situation has been aggravated by the emergence of the HIV/AIDS pandemic in Africa in the mid-1980s, with a marked negative impact on socio-economic progress. The countries of Southern Africa are the worst affected in the world - South Africa is home to the largest population of people living with HIV/AIDS (5.7 million in 2008) (UNICEF, 2010:unnumbered) while neighbouring Swaziland is the country with the highest HIV prevalence rate (26.1% of all adults). According to the United Nations Development Program (2005:2) the pandemic has stopped possible economic and social progress. If current trends continue the "*longer term existence of Swaziland as a country will be seriously threatened*" (UNDP, 2006:2).

At the same time, regular reports are published of yet another species gone extinct, another tract of forest disappearing, and yet another coral reef that has been destroyed. Although the loss of biodiversity is serious, the most urgent environmental problem is climate disruption.

All this will be enough to demoralise even the most determined optimist. Instead of giving up and accepting the status quo, we need to renew our focus and with creativity fashion a new sustainable future in which all will share equally. It is not possible to ignore the needs of the poor. They have a legitimate right to 'receive' development. What that means is not always clear. At the very least it

should address the basic needs of a population, enabling them to lead a healthy life, be educated and have access to a decent standard of living. Development should be mindful of the environmental limitations within which it must take place.

There is growing international support for achieving development objectives while addressing environmental challenges – in particular global warming. Policy makers have started referring to a "'*...green New Deal'. Investing to cut greenhouse gasses can create 'green jobs' and provide fiscal stimulus while protecting the planet. But how is it going to be paid for?*" (Smith, 2009: unnumbered). The way to finance development and redevelopment interventions has been an ongoing debate over the last few decades, often pitching rich and poor against one another with the same tired arguments. Besides the 'normal' investment needed for growth and development, additional needs have arisen which needs to be urgently addressed. The question then arises whether the pursuit of sustainable development needs special financing?

Policy makers' realisation that the international development finance system need to adapt to new challenges has radically changed the context of development finance over the last 20 years. Adopted at the end of the century, the Millennium Development Goals (MDGs) have renewed hope for progress on development and poverty reduction, while creating a focus and an impetus for searching for new and additional sources of development finance. Policy makers are in agreement that all development resources including domestic savings, market mechanisms and official development aid must be unlocked, while a more effective and performance-oriented aid-management culture must be fostered. To complement traditional grants and loans, existing as well as new actors are turning increasingly to innovative mechanisms to raise and deliver funds. Treating aid as just one of several finance flows and involving the private sector in the development process, marks an important shift in consciousness.

There are two ways to make additional funding immediately available for sustainable development; reduce damaging flows and increase positive flows. The world is spending trillions of dollars subsidising unsustainability (Pearce, 2007:454). If those subsidies could be discontinued, funds would immediately be available for sustainable development interventions. Powerful elites, who have

captured rents associated with the subsidies, ferociously oppose any changes to the status quo. This can be seen in the modest progress made in reversing agricultural subsidies in rich countries.

More success can be shown in stopping a second source of damaging flows – debt repayments. Many poor countries have benefitted from various debt relief programmes, which already have had a positive impact on resource availability for local development interventions.

At the same time positive flows must be increased. Despite the negative critique official development aid (ODA) and foreign direct investment (FDI) often receive it remains important sources of investment. Aid may come under pressure within the next few decades as a result of a demographic transition taking place in many rich countries. This demographic transition is boosting an important emerging trend. As rich country populations age, these economies attract workers from poor countries. Already their remittances back to their home countries are having a marked effect on the availability of development finance on a micro-scale. There are also some interesting suggestions for new sources of finance. These range from global taxes on currency transactions and arms sales, to creating a global lottery and issuing global premium bonds.

A relatively recent development which is often described as an innovative market-creating tool to achieve sustainability is the creation of carbon markets. They are seen as a cost effective way of creating a demand for new environmentally friendly technologies, while putting a price on pollution and thus an incentive to pollute less. Emerging over the last two decades, carbon markets have grown exponentially since the adoption of the Kyoto Protocol requiring the establishment of regulated international carbon markets.

1.2. MOTIVATION FOR THE STUDY

I have been working in 'development' for nearly twenty years, both in the public sector as well as in a variety of private sector organisations. In the process I have gained some insight into the difficulties accessing adequate finance for development interventions, especially for 'marginal' projects.

Within the public service, available funding is rigidly employed in line with budgeted processes. This complicates the ability to be responsive to community needs or project realities. In addition, in South Africa, the requirements of the Public Finance Management Act, even though necessary to safeguard public money, set hurdles in the way, slowing down the development process. Governments do not always focus on sustainability; their interventions are often motivated by political expediency within a fairly rigid policy context.

In the non-governmental sphere, even though the rules and processes may be less rigid, finance allocations are not necessarily easier. Development programmes are often funded through grant financing allocated to achieve specific deliverables specified in a grant agreement. While acknowledging that this is a subjective view, in my experience funding provided by foreign governments are often only there to serve the political or marketing needs of the grant maker, being far removed from the needs and realities of the development context. Decisions on priorities made in Washington, London, Beijing or Geneva cannot serve current local needs adequately.

Besides complications arising from political agendas, it is often difficult to access sufficient amounts to effectively facilitate sustainable development interventions. Poor countries needs massive amounts of investment in physical infrastructure, as well as social and economic development programmes to assist them on their way to sustainability. Within the context of the environmental limitations on development, current financing programmes are inadequate. This experience led me to investigate alternatives to the way we finance sustainability.

1.3. PURPOSE OF THE STUDY

In the renewed focus on poverty alleviation in the international development arena, there has been an emphasis on development assistance from rich donor countries to poor developing countries. This however may not be a reliable source of development finance.

In the context of sustainable development, poor countries will not be the only ones requiring development finance. It is clear that rich countries need to undergo a process of 'redevelopment' to

adjust to a more sustainable development trajectory. This will place unprecedented demands on the international financial system, which is still in the process of recovering after the recent financial crisis. It may therefore be necessary to look at alternative sources of development finance. There are some interesting proposals around. One alternative, which has received a lot of attention lately, is carbon finance and the possible contribution thereof to sustainable development.

This paper investigates alternative sources of finance for sustainable development in South Africa. It specifically investigates carbon trading, as an alternative, market-based mechanism to raise development finance, while making direct positive contributions to sustainability.

Specifically this paper provides an overview of:

- The meaning and context of sustainable development;
- Some alternative sources of development finance;
- Carbon trading, including:
    - its history and development;
    - theory supporting carbon trading;
    - additionality;
    - critique of the concept;
    - voluntary markets; and
    - compliance markets; and
- The clean development mechanism in South Africa.

1.4. RESEARCH QUESTIONS

This research seeks to determine if carbon trading is a useful source of development finance for sustainability in South Africa. Based on an initial review of the literature, the following research questions were formulated:

1) What constitutes the more traditional sources of development finance for developing countries?

2) What are some alternative sources of development finance?
3) How much sustainable development can be expected from clean development mechanism projects?
4) What is the scale of potential income from the clean development mechanism for South Africa?
5) What can the South African Government do to leverage the clean development mechanism to benefit the poor?

1.5. RESEARCH METHODOLOGY

Research is the collection of information about a particular subject. According to Muller (2010:unnumbered) it requires "*an active, diligent and systematic process of inquiry in order to discover, interpret or revise facts, events, behaviours, or theories*." The process of inquiry selected for this research, is an empirical research methodology exploring and analysing existing data (Mouton, 2001:57).

According to van der Merwe (1996:287) exploratory studies are "*focussed on the exploration of a relatively unknown area. Aims can be to:*

- *Obtain new insights into the phenomenon;*
- *Conduct a preliminary investigation as a precursor to a more structured study;*
- *Explicate central concepts and constructs;*
- *Determine priorities for further research; and*
- *Develop new hypotheses about an existing phenomenon*".

Exploratory research methods include reviewing existing relevant literature, surveys and analyses of relevant examples. The method selected for this study is a review of existing literature appropriate to the topic in order to familiarise myself with "*the latest developments in the area of research, as well as in related areas*" (Bless & Higson-Smith, 2000:20). In the process I used books, journal articles, websites, databases, abstracts and opinion pieces, the oldest of which dates back to 1961, but with

the majority published over the last decade. In order to get clarity on published data and get insight into the national perspective, I interviewed officials from the Designated National Authority.

According to Mouton (2001:179 - 180) a review of the literature is "*essentially an exercise in inductive reasoning, where you work from a sample of texts that you read in order to come to a proper understanding of a specific domain of scholarship.*" Inductive reasoning being a process of describing, evaluating and reasoning, a literature review therefore aims to review the critical points of current knowledge on a specific topic. Van der Merwe (1996:279) describes inductive logic as "*reasoning that proceeds from specific experiences to general truths... From the researcher's perspective, this means that the research project is initiated without any explicit conceptual framework. The research is loosely guided by general hypotheses or conjectures. This type of research is less structured and it is only after the data has been generated that the researcher looks for links and patterns in the data. The outcome of this type of research is a more systematic explanation or even a new conceptual framework. Studies featuring inductive logic are usually hypothesis-generating and their goals are normally exploratory*".

Bless and Higson-Smith reports the identification of relevant sources as the most common problem when starting a literature review. They argue that "*often the impression is created that nothing has as yet been written on the chosen topic and the multiplicity of non-relevant literature can be overwhelming*" (Bless & Higson-Smith, 2000:21).

This was a challenge that had to deal with. Subsequently, the approach of the study was first to obtain a broad range of relevant literature from expertise in the field, and information specialists. In addition, online resources were accessed for amongst others policy documents, media statements and discussion papers. Since carbon trading as a field is still relatively young, this proved to be a valuable source of information. Key words that were used in the search included:

- Carbon trading;
- Clean development mechanism;
- Development finance;
- Sustainable development; and

- Voluntary carbon markets.

Importantly, the context was established through a comprehensive overview of the initial material; in total 388. From this material, the most relevant items were selected and their bibliography and references interrogated to find new sources and more precise information – a snowballing technique.

The documented sources were selected to ensure an appropriate breadth and depth to the study. As a result of the complex nature of sustainable development and the diverse nature of the research topic, an interdisciplinary approach was applied to source selection, including documents from the following disciplines and fields:

- Sustainable development theory and practice;
- Development theory and practice;
- Economics;
- Finance;
- Emissions trading;
- Climate change; and
- Policy statements by national and international agencies.

There are some inherent risks to a literature review, including being "*influenced by the results of previous research, or one may accept without criticism their chosen characteristics and explanations so that one fails to discover new possibilities and to observe without preconceptions or expectations*" (Bless & Higson-Smith, 2000:20). In addition, the researcher may only be influenced by the literature they are aware of.

Another disadvantage of a literature review is the use of secondary sources. Since my purpose with the study is to familiarise myself with the latest developments in the area of research, I do not attempt to report any new or original work. Since I possessed limited prior knowledge on the specific topic, I approached the study in an unbiased way. My goal was to get up to date with current literature with a view to a practical application in the future. Despite these risks associated with the research methodology, it is the most appropriate methodology for the purpose of the study.

1.6. RESEARCH LIMITATIONS

As with any research, there are limitations that exist with the body of work. The research conducted for this study had, inter alia, the following limitations:

- A disadvantage of a literature study is the use of secondary sources. I did not attempt to report any new or original work, but rather to answer the research questions by reviewing existing scholarship.
- The literature study and the reporting of key issues may be biased brought about by the author's perceptions or interests.
- Access to information, especially the limited accessibility of information on the South African context. In this regard, very little documented information exists on the size, scope and impact of the voluntary carbon market in South Africa.
- Available resources, including researcher time, limited the scope of the study.

1.7. STRUCTURE

This thesis consists of eight chapters as illustrated in figure 1.1. Chapter 1 introduces the topic and outlines in broad terms the scope, motivation for and purpose of the study. The research methodology is briefly discussed and the structure outlined. Chapter 2 provides an overview of the concept of sustainable development.

Chapter 3 investigates development finance, specifically existing and possible future sources of development finance. Chapter 4 introduces the concept of carbon trading, its history and development, the theory of carbon trading, and the concept of additionality. Chapter 5 focuses on voluntary carbon markets, while in chapter 6 compliance markets are discussed. Chapter 7 provides an overview of the South African context and the development and potential of the clean development mechanism in South Africa. The conclusion and recommendations of the way forward is found in chapter 8, followed by a Bibliography and Appendices providing additional information.

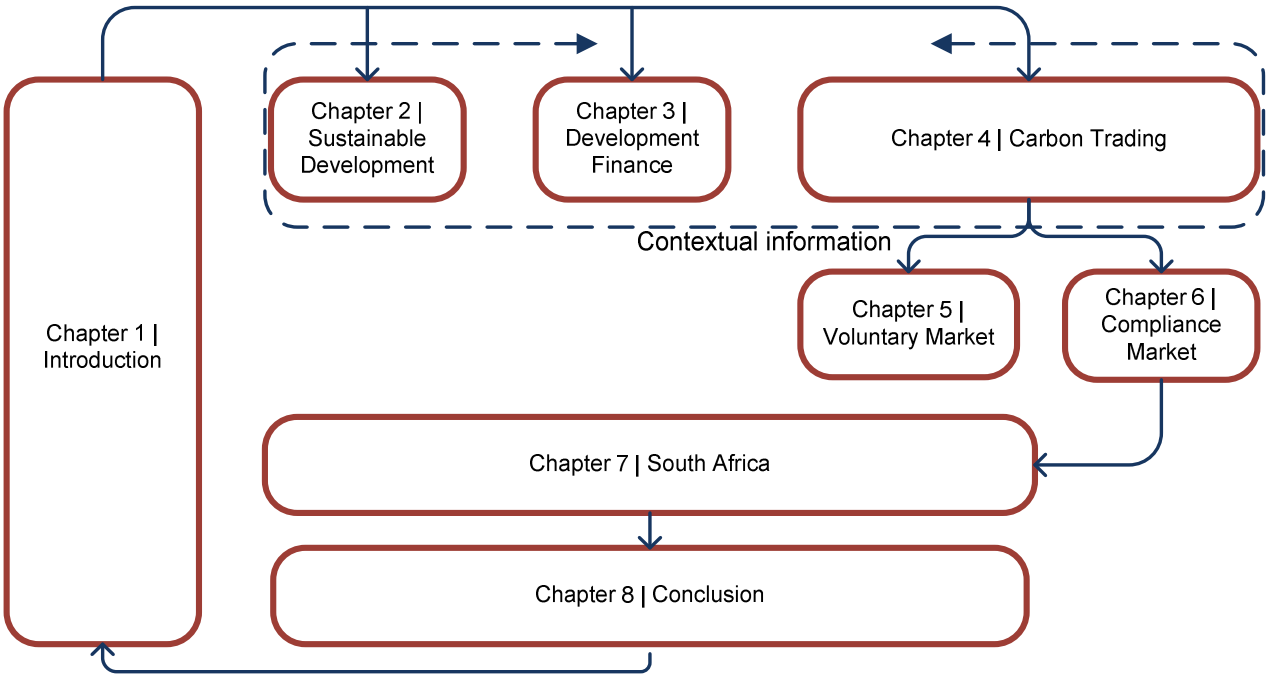
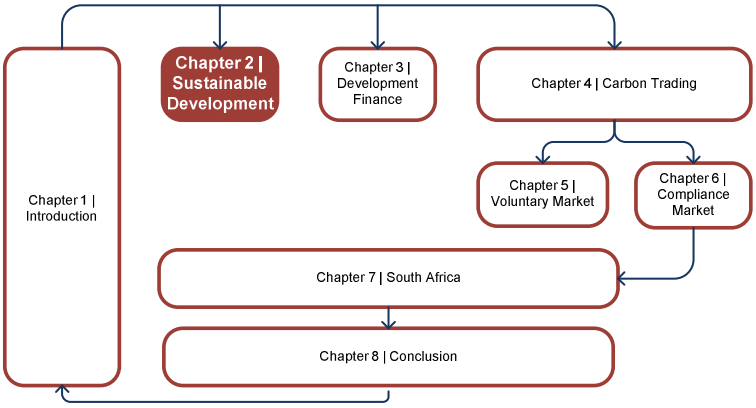


Figure 1.1 | Research Structure

Research focused on three themes to create context to the discussion in chapter 7 on the South African experience:

- Sustainable development (Chapter 2);
- Development finance (Chapter 3); and
- Carbon trading (Chapters 4, 5 and 6).



2.1. INTRODUCTION

By way of introduction to the context within which the debate on development finance occurs, chapter 2 gives a brief introduction to the concept and dimensions of sustainable development. Flowing from the definition of sustainable development, the chapter gives an overview of the concept of needs and specifically needs of the poor against the background of growing insight into the development process. Counter balancing this is the concept of environmental limits, discussed in the context of global climate disruption. The chapter closes off with a discussion of the different interpretations of the meaning of sustainable development. The fact that there are different interpretations adds a level of complexity to the debate on the need for and effectiveness of development finance for sustainability.

2.2. THE EMERGENCE OF SUSTAINABILITY

Over the last four decades it became clear that development theory and practice had reached a turning point. At first 'development' largely meant westernisation, but this process began to threaten the delicate balance between social and ecological systems in many developing societies (Treurnicht,

2000:61-63). There were two crises which lead to this paradigm shift. The first was an intellectual crisis brought about by the replacement of indigenous knowledge systems with western beliefs and the resultant failure of 'development' practice in non-western societies.

The other was the emerging environmental crisis and specifically human induced climate disruption which affects every society on the planet. Several authors (Lichtman, 2003:1; Bartelmus, 1994:7 and Treurnicht, 2000:61) see the need to address these two crises, and to integrate it with economic policy, as the impetus that gave birth to the concept of sustainable development. Dresner (2002:63) affirm that this process specifically *"…was to be the ground on which the mainstream was to consider the environmentalist case."*

In our new 'environmental age' emerging over the last twenty years, the terms sustainable development and sustainability has become interwoven into public policy debates and statements. It is in fact used so often, in countless number of contexts and with an endless variety of meanings that it is in danger of becoming meaningless jargon. This is apparent in one of the most common points of criticism against carbon trading; often accused of being divorced from the goals of 'sustainable development', yet without providing any clarity on what is supposed to be achieved.

Part of the problem is that there is no agreed definition of what sustainable development is or should be. A reason for this can be the ambiguity of the term 'development', which Sachs (2002:14) criticises as a term which *"can mean just about anything… It is a concept of monumental emptiness, carrying a vaguely positive connotation… As a result, the notion of sustainable development has been stripped of any clear meaning by linking 'sustainable' to 'development'… What exactly should be kept sustainable remained forever elusive, giving rise to eternal quarrels about the nature and scope of sustainable development."*

Acknowledging that giving a precise definition of sustainable development is complex, it is nevertheless possible to identify a common set of core principles contained in the concept. *"In essence, the concept is fairly straightforward: sustainable development is all about behaving in a manner in which current efforts to raise the quality of life of a society's citizens (i.e. 'development') can be continued (or 'sustained') into the future. It is about adopting a development path that improves*

the quality of life of current generations, yet that leaves future generations with at least the same capacity and options for development that we have at present" (Hanks, Sowman, Swilling, Wilson, & van Breda, 2005:2). The new focus was on forms of economic development that would permanently raise the living standards of the world's population, and especially the living standards of the poorest people. *"The notion of permanent development was intended to avoid forms of economic change that would benefit generations now but would impose unacceptable risks for generations in the future"* (Pearce & Barbier, 2003:172).

The most often quoted definition of sustainable development is to be found in the 1987 United Nations report, 'Our Common Future' – the famous Brundtland report. Even though it was not the first international report to focus on the notion of sustainability, it remains the best known. It defines sustainable development as *"development that meets the needs of the present without compromising the ability of future generations to meet their own needs."* (Gallopin, 2003: 21; Mebratu, 1998:501). According to Dresner (2002:64) this definition has often been criticised as being too vague.

The problem of finding a balance between environmental and economic concerns resulted in a consensus on a definition *"that was at the very least rather vague. Some have seen the vagueness as meaninglessness: you can claim anything as part of sustainable development"* (Dresner, 2002:63).

What is important and often overlooked is that the definition contains within it two key concepts:

- *"The concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and*
- *The idea of limitations imposed by the state of technology and social organisation on the environment's ability to meet present and future needs"* (Mebratu, 1998:501).

2.3. THE CONCEPT OF NEEDS

Poverty eradication first emerged as part of an explicitly stated international public policy point during the 1940's when American President Franklin Roosevelt said that *"…he would like to extend freedom from want to all the peoples of the world"* (Mock, 2005:5). Till then assisting the poor was seen as

charity and a local responsibility, but the post-war world institutionalised and formalised a focus on poverty eradication. Roosevelt's successor, President Truman, in 1949 set the objective of global development, which at the time was generally seen *"in terms of increasing that newly invented measure, (gross national product) GNP"* (Dresner, 2002:68). Within the context of the sustainability crises this is problematic.

Even though much progress has been made over the last several years to *"end poverty"* (Sachs, 2005:24), McLaren (2003:21) argue that there is a widespread yet wrong assumption that sustainable development means that countries of the South need to be developed to attain the same levels of wealth (in its narrow sense), consumption and well-being as those of the North[1]. This belief assumes that sustainable development is simply a more efficient, better managed process of conventional economic development, which emphasises growth in the gross domestic product of states.

Conventional economics measures a country's wealth and therefore its development status in terms of its gross domestic product (GDP), treating the consumption of natural resources as if it were income. In contrast, the conditions for sustainability would be achieved if *"capital was non-declining"* (Dresner, 2002:73). This implies that attention should be given to the notion of increasing stocks of overall per capita wealth where 'wealth' comprises a broad spectrum of assets corresponding to the five classes of capital which can be used to measure sustainability (Ruta and Hamilton: 2007:45). This includes manufactured capital, human capital, social capital, financial capital and natural capital.

"It cannot be taken for granted that rich countries pursue paths of development that obey the fundamental 'rising per capita wealth' rule" (Pearce, 2007:453). In fact, Sachs (2000:18) goes so far as to say that *"…the times of copycat development are over. Not because emulation of the North has not produced the desired results, but because the development model of the North is historically*

[1] Global North and South are used with reference to the traditional classification of states into "developed" (North) and "developing" (South). Countries of the North are mostly members of the Organisation for Economic Cooperation and Development (OECD).

obsolete." This implies that all countries – even rich 'developed' countries – are in need of a new sustainable development paradigm.

The post-war world's focus on poverty eradication employed the traditional definition of poverty which focused only on material - specifically monetary - measures of well-being. Poverty therefore would be the state of having little or no money and few or no material possessions. Yet poverty is a multidimensional phenomenon, characterised by an inability to satisfy basic needs, lack of control over resources, low levels of education and skills, poor health and malnutrition. In addition the poor lack adequate shelter, have poor access to water and sanitation and are vulnerable to shocks, violence and crime. The poor also often lack political freedom and do not have a 'voice' in public affairs.

A more holistic, multi-dimensional way of looking at poverty only emerged recently. As a result, definitions of poverty have expanded to include the social and psychological burdens of daily survival of the poor. *"Poor people not only endure deprivation in relation to income and human development, but also suffer from great income insecurity. They are profoundly constrained in their ability to shape their own lives"* (Tungodden, 2003:13). This broader conception is seen as a lack of capabilities that enable a person to live a life they value, including income, health, education, empowerment and human rights (Mock, 2005:6). South Africa's Department of Social Development (2006(b):27) attempts to define poverty from both the individual and community perspective. This includes:

- Assets poverty, including a lack of assets and food;
- Income poverty, including lack of income and limited access to basic services; and
- Human capital poverty, which refers to a lack of access to skills and education.

2.3.1. DIMENSIONS OF POVERTY

While there are many different views on what poverty is, it is useful to distinguish between dimensions or degrees of poverty - extreme or absolute poverty, moderate poverty and relative poverty (Sachs, 2005:20). Extreme poverty has become synonymous with acute want or deprivation in the classically accepted sense, where households cannot meet basic needs for survival. Moderate poverty is

characterised by *"… conditions of life in which basic needs are met, but just barely"* (Sachs, 2005:20). A shock can push households back into conditions of extreme poverty. Within the context of World Bank policy those classified as living in absolute poverty would be living on less than $1.25[2] (constant 2005 prices) per day per person. From Figure 2.1 and 2.2, it is clear that much progress has been made recently in addressing absolute poverty in all regions except in Sub-Saharan Africa.

Relative poverty essentially has to do with the deprivation of individuals relative to others in the society in which they function. Therefore relative poverty is a universal and permanent feature of human society. Relative poverty is generally described as a household income level that falls below a predetermined average of national income. Whereas all three dimensions of poverty are found in developing countries, only relative poverty is still found in countries of the North.

The eradication of absolute poverty is a focus within the scope of the wider development debate. It is an emotionally and politically charged issue in the Global South and a source of tension between the North and South. In fact, *"developing countries were deeply suspicious of the emerging environment issue as a 'disease of the rich' which could impose new constraints on their central priority of economic development"* (Strong, 2003:22). In addition, the introduction of various ideological issues into the poverty debate has at times diverted attention from addressing absolute poverty. As a result, inappropriate social and ideological agendas are frequently pursued in the name of poverty reduction (Ackron, 2002:1).

[2] In this thesis the "$" will always refer to the United States' dollar, unless specifically indicated otherwise.

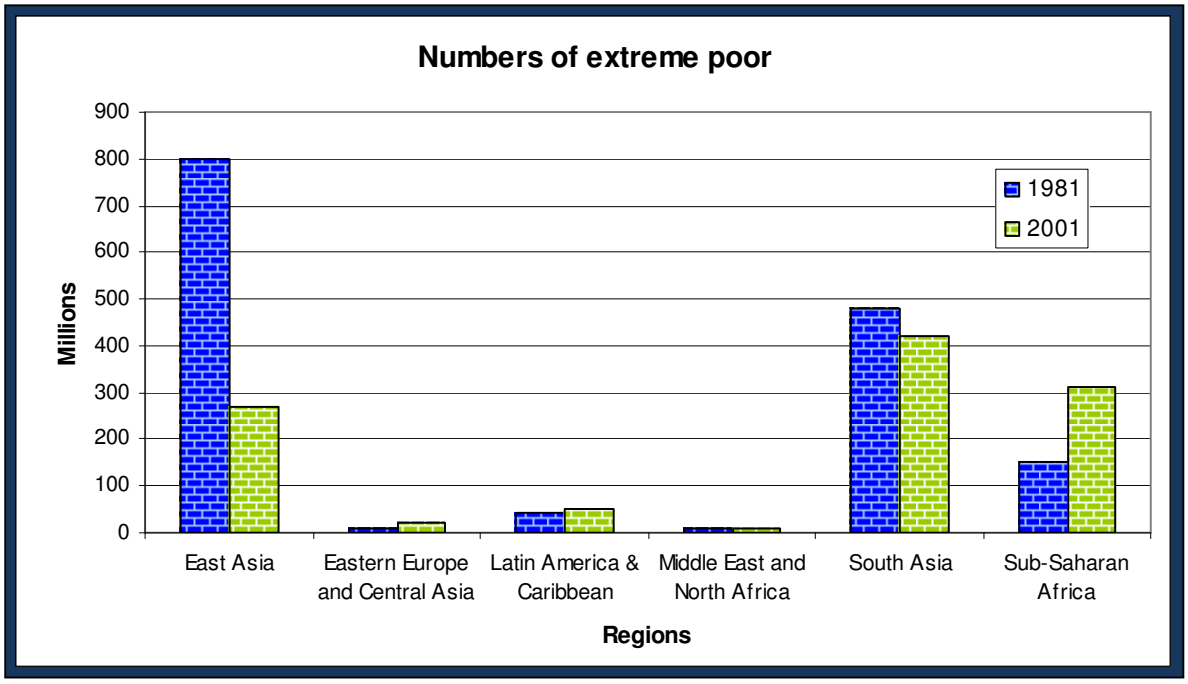


Figure 2.1 | Number of Extreme Poor per Region (Source: Sachs, 2005:21)

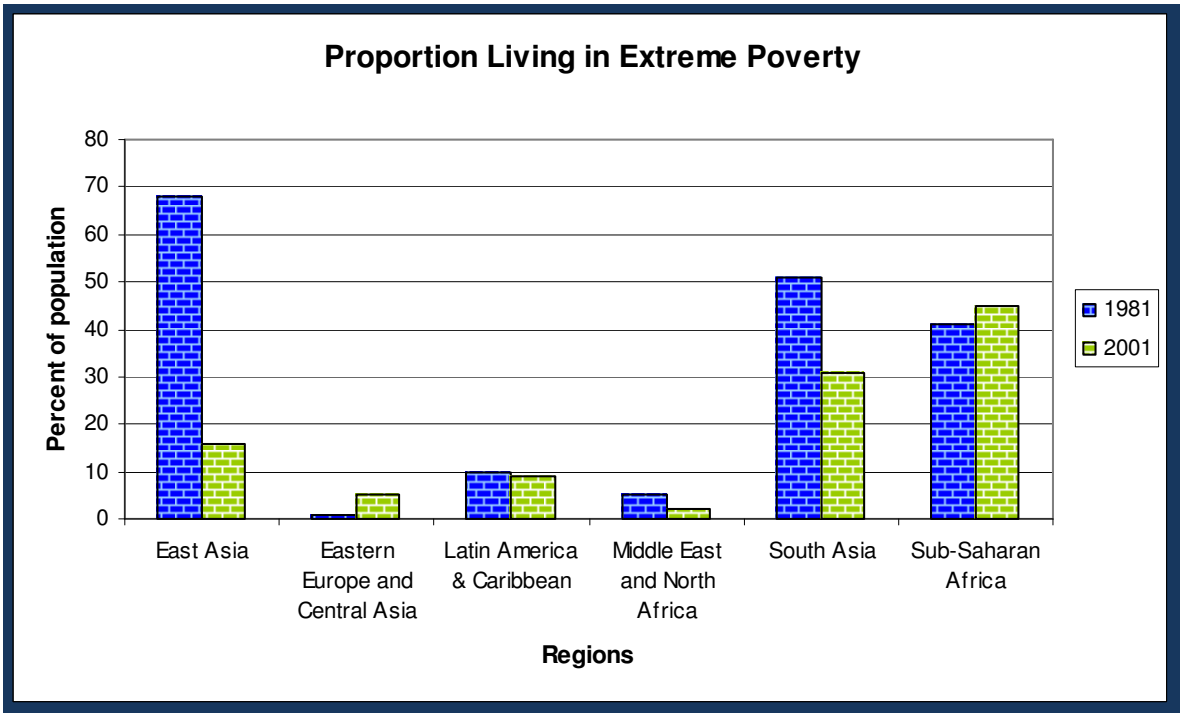


Figure 2.2 | Proportion of Population Living in Extreme Poverty (Source: Sachs, 2005:22)

2.3.2. APPROACHES TO POVERTY

As mentioned before, part of the difficulty in defining the concept 'sustainable development', is that there is no agreement on what is meant by 'development'. Development became explicitly part of public policy in the late 1940s. For the first few decades *"development was pursued through state-directed industrialisation. In the newly independent countries, some were more 'socialist' and emphasised state ownership of most of the economy, while others were more 'capitalist' and allowed extensive private ownership"* (Dresner, 2002:68-69). Whatever the individual preference between socialism and capitalism, the state played a central role in promoting industrialisation.

Historically, colonial country economies were geared towards exporting commodities to metropolitan countries and importing manufactured goods from them in turn. Most newly industrialising countries followed a policy of import substitution to promote national self-sufficiency. Available capital – often from foreign aid – was concentrated on creating specific industries, which it was believed would set in motion a process of industrialisation. Once this process matured it will become self-sustaining.

This industrialisation process did not include an explicit focus on assisting the poor, since it was believed that the solution to the poverty problem was simply employment. In a desperate search for employment opportunities, expanding populations migrated to urban areas, resulting in worsening conditions for the poor. These failures of 'development' lead to a search for new approaches summarised in Figure 2.3.

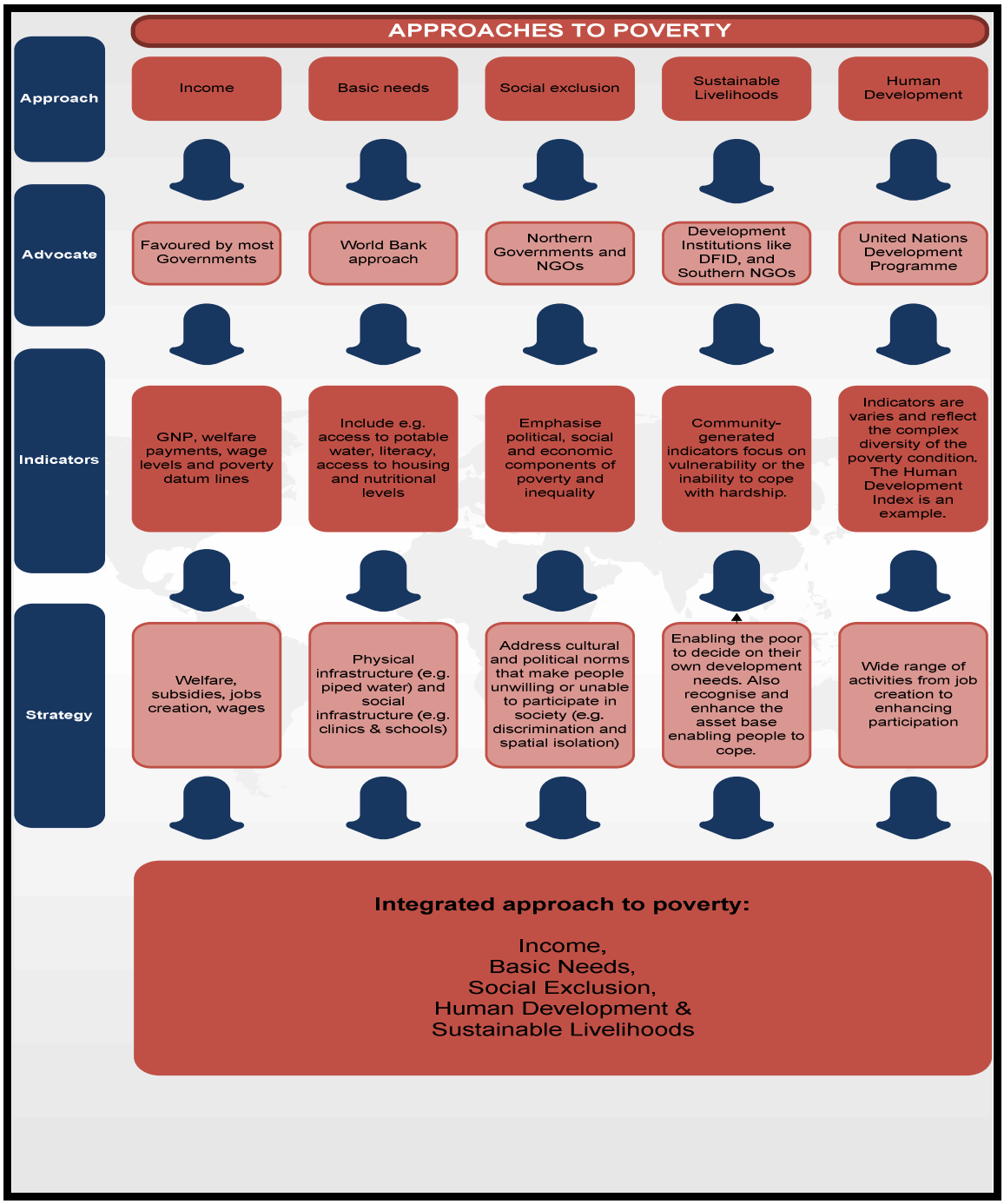


Figure 2.3 | Approaches to Poverty (Source: du Preez, 2006:10)

2.3.2.1. INCOME

The Income approach is the oldest and still most widely used approach to poverty. Accordingly, a person is seen as poor when their personal income or consumption level falls below a specified 'poverty line' (Nunan, 2002:9). The poverty income line is defined as the level at which households

have enough income to meet their basic needs, which would include nutrition, shelter and transportation (Davids, 2005:38).

The Income approach to poverty is favoured by most governments and economists, who see the solution to poverty as full employment attained through economic growth. This is problematic in the current context of sustainability, since economic growth traditionally relied on the exploitation and conversion of natural capital. While economic growth is essential for sustainable poverty reduction, the very poor do not benefit from any 'trickle-down' effect that may result from growth. In countries where growth is inadequate, there is a need to put in place mechanisms that reduce poverty directly and improve the ability of the very poor to contribute to growth.

In 1990, the World Bank began using the measure of $1 per day as an official "international poverty line, meant to roughly approximate the poverty lines of low-income countries" (World Bank 1990:27). Even though the '$1 per person per day' measure is a complicated statistical standard measuring income at purchasing power parity, it features prominently in public policy circles (Sachs, 2005:20). This measure remains controversial, but has provided a starting point for international comparison and for important poverty initiatives, including the United Nations' Millennium Development Goals. Using this measure places 1.1 billion people in extreme poverty.

There are several criticisms against the Income approach to poverty. According to Chossudovsky (1998:298), the World Bank framework departs sharply from established concepts and procedures for measuring poverty, since it arbitrarily sets a poverty threshold at $1 a day, labelling people with a per capita income above one dollar a day as 'non-poor'. This measure is used irrespective of actual conditions at the relevant country level. For example with the liberalisation of international commodity markets, the domestic prices of basic food staples in developing countries have risen to world market levels. As a result the one dollar a day standard has no rational basis since many people in developing countries with per capita incomes of more than one dollar a day are unable to meet basic expenditures on food, clothing, shelter, health and education (Chossudovsky, 1998:298).

The very poor tend also to depend on non-income sources of support, such as extended family, that are not taken into consideration with this approach. For example, the Commission for Africa in its

report (2005:30) found that *"Africans survive – and some prosper – in the face of low incomes and few jobs in the formal economy. They do so using a complex network of social relations…"*

In addition the value of environmental and public services is not captured. It is therefore possible for environmental and public services to deteriorate considerably, with significant negative impacts on the poor themselves, without any effect on the income-expenditure based measures of poverty incidence (Kanbur, 2001:7). This approach usually only focus on national figures; so while the national incidence of poverty may be falling, it may very well mask the growth in the incidence of poverty experienced for example in rural areas. After consistent criticism, the World Bank adjusted the $1 per day measure to $1.25 per day during 2005 (in constant 2005 dollars), to incorporate changed circumstances.

2.3.2.2. BASIC NEEDS

Thinking about poverty expanded with the development of the concept of basic needs, formulated by the International Labour Organisation (ILO) in 1976 (Martinussen, 1997:298). Against the background of a growing disillusionment with the results of development planning, it was realised that the poor were disadvantaged by lack of education, bad health and nutrition, and could therefore not 'compete' on an equal footing with the non-poor. In its broader conception it involved a reassessment of development essentially defined as economic growth, and reflected a new awareness of ecological and environmental costs (Haines, 2000:45-46). The basic needs approach is not necessarily one coherent theory, but includes many different strategies (Haines, 2000:47).

The approach is based on the view that economic growth does not necessarily lead to a substantial expansion of employment opportunities and incomes for the poor. Measures such as the diffusion of resources targeted at the poor are needed in addition to growth. Accordingly, the most important goal of development is to ensure that the basic needs of the poor are satisfied (Monaheng, 2000:131). Basic needs are defined as a minimum consumption basket, which may include food, water, shelter, clothing, health care and education. Some well-known poverty indicators originating from the basic needs perspective include access to potable water, literacy, life expectancy and nutrition levels

(Davids, 2005:39). Other indicators incorporate issues of ill-being, shelter, clothing and access to health services (Nunan, 2002:9). In practice, the approach tended to *"concentrate on top-down state provision of basic public services, rather than the non-material aspects to empower the poor themselves"* (Dresner, 2002:69).

The debt crisis emerging in the early 1980s created pressure to reduce public spending, shifting the development emphasis away from basic needs to 'structural adjustment'. Yet it did not completely disappear. Even where *"other perspectives on poverty are highlighted, there is a strong emphasis on first satisfying the elements of deprivation as defined from a basic needs perspective. Where people wish to add other interpretations to the material definition of poverty, they refer to 'going beyond a basic needs approach' – in other words, not only including, but extending, the basic needs definition of poverty by focusing on space or livelihoods"* (Davids, 2005:39).

2.3.2.3. SOCIAL EXCLUSION

The social exclusion perspective has its origins in European experiences of poverty, where most people's basic needs have been met. There may be little income poverty, but there remains a group that is excluded from the mainstream benefits of society and is prevented in some way from fully enjoying general prosperity (Davids, 2005:39-40). Groups may be discriminated against on the basis of a variety of characteristics, including their sex, race, age or where they live.

The perspective has two main defining characteristics. Firstly, it focuses on the multidimensionality of deprivation - people may be excluded or deprived in the economic, social and political spheres and are often excluded from different things at the same time. Secondly, social exclusion implies a focus on the relations and processes that cause deprivation. People can be excluded by many different sorts of groups, often at the same time. Exclusion happens at each level of society (de Haan, 1999:8).

Social exclusion as a perspective on poverty is important because it causes the poverty of particular people and gets in the way of poverty reduction (United Kingdom, 2005:5). It hurts people materially but can also hurt them emotionally, by shutting them out of the life of their community. Socially

excluded people are often denied the opportunities available to others to increase their income and escape from poverty by their own efforts. So, even though the economy may grow and general income levels may rise, excluded people are likely to be left behind. Poverty reduction policies often fail to reach them unless they are specifically designed to do so.

Social exclusion reduces the productive capacity – and rate of poverty reduction – of a society as a whole. Exclusion does not cause poverty through a simple sorting of those who can or cannot participate in society. Socially excluded groups often do participate but on unequal terms. Labour markets illustrate this most clearly by exploiting the powerlessness of excluded groups and at the same time reinforcing their disadvantaged position (United Kingdom, 2005:5-6). Some would argue that the elements of social exclusion have been entrenched in the Bretton Woods institutions, perpetuating the existence of global poverty. Building on this argument, it has further been institutionalised in the unfair distribution of greenhouse gas emissions rights in terms of the Kyoto Protocol.

2.3.2.4. SUSTAINABLE LIVELIHOODS

A fourth perspective is one that adopts a sustainable livelihoods approach. It is argued that income poverty has assumed importance only because of its relevance to developed countries. According to Chambers (as cited in Nunan, 2002:10), when the poor are asked, income deprivation is often quite low on their priority ranking, below self-respect and lack of domination.

The sustainable livelihoods approach, developed by Gordon and Conway in the 1980s, stresses the participation of individuals and communities in defining and solving their own poverty. Participation offers valuable opportunities to rectify the inequality of top-down, prescriptive approaches and improves the chances of achieving sustainable development.

A core belief of this approach is that the conventional understanding of poverty does not adequately describe the actual experience thereof. For the poor, poverty is a local, diverse and dynamic condition. While poverty relates to a lack of physical necessities, assets and income, it is also more than this (Nunan, 2002:9-11). The poor are not a homogeneous group, but experience poverty in

different ways - they are not poor or vulnerable in the same way. Identifying the local variations in poverty and deprivation is crucial in shaping effective development strategies. By focussing on vulnerability or the inability to cope with hardship, rather than on poverty *per se*, the issues that emerge may not be the lack of an income or even employment, but may rather be factors such as the breakdown of the family or other social problems (Davids, 2005:40). In terms of the linkages between poverty and environment, these are inevitably complex and diverse, reflecting the diversity of poverty dimensions and experiences (Nunan, 2002:9).

As an approach to poverty eradication, the livelihoods approach *"…looks to the poor themselves and recognises them as actors who shape their lives even under conditions of hardship and destitution. In this view, poverty derives from a deficit of power rather than lack of money"* (Sachs, 2000:21). *"To be poor was to experience ill-being in many ways and to suffer multiple disadvantages that reinforce each other and interlock to trap them"* (World Bank, 2000:40). Poverty is now seen as *"a multidimensional, dynamic, complex, institutionally-embedded, and a gender- and location-specific phenomenon"* (World Bank, 2000:4).

2.3.2.5. THE HUMAN DEVELOPMENT APPROACH

Trainer (2002:56) argues that what matters most to the development process is not how much wealth (in the narrow definition) has been created or how much economies have grown, but what changes have occurred in the quality of life of those in most urgent need, and what improvements have occurred to ecosystems. To illustrate this failure of 'traditional development' approaches, the Human Development Report of 1996 stressed that the poorest one third of the world's people actually experienced a marked long-term deterioration in their real living conditions. Over 1.6 billion people were found to be getting poorer each year (Trainer, 2002:56).

It has been wrongfully assumed *"...that higher wealth and consumption directly translate to higher well-being and quality of life. Empirical evidence seems to demonstrate that in reality there is no direct correlation between income and quality of life at all levels. This creates scope for policies which can reduce inequalities in well-being without increasing aggregate material consumption"* (McLaren,

2003:21). During the 1990's, a new model came to prominence placing the emphasis on human development as opposed to an absolute focus on economic growth. *"Human development judges a society's standard of living not just according to the average level of income, but according to people's capabilities to lead the lives they value"* (Dresner, 2002:70). The human development approach emphasises an integrated and comprehensive view on development incorporating most of the key elements of the other perspectives (Davids, 2005:40).

Based on the view that market mechanisms are essentially unfriendly to the poor, the weak and the vulnerable, it defines development as *"a process of enlarging people's economic, social, cultural and political choices"* (Martinussen, 1997:303). The concept of human development over time extended to basically all areas of development, such as social infrastructure and services, gender equality, equal opportunities for participation in political and economic development, empowerment of citizens and civil society organisations, enabling legal and institutional frameworks, and environmental and natural resource sustainability.

The best known example of a composite measure of human development is the United Nations Development Programme's Human Development Index (HDI), published for the first time in 1990 in the Human Development Report. It is a weighted index that includes education, life expectancy, and per-capita GDP as a measurement of development progress (UNDP 2001:137). Several nations with a low GDP score relatively highly in this index. In line with the core beliefs of the human development approach, the index measures people's choices in three essential areas:

- opportunity to live a long and healthy life;
- opportunity to acquire knowledge; and
- opportunity to have access to the resources needed for a decent standard of living.

Since then, three supplementary indices have been developed: the human poverty index (HPI), gender-related development index (GDI) and gender empowerment measure (GEM). The concept of human development, however, is much broader than the HDI and these supplementary indices.

According to Kanbur (2003:8), the conceptual foundations of the HDI are weak, because the conceptual foundations for multi-dimensional poverty and well-being are not yet strong enough to give

confidence in the deployment of operational measures such as the HDI. It is impossible to come up with a comprehensive measure—or even a comprehensive set of indicators—because many vital dimensions of human development, such as participation in the life of the community, are not readily quantified. While simple composite measures can draw attention to the issues quite effectively, albeit useful, these indices are no substitute for full treatment of the rich concerns of the human development perspective.

2.4. THE CONCEPT OF LIMITS

The modern environmental movement emerging in the 1960s was sparked off by Rachel Carson's book 'Silent Spring', which implicitly challenged science and the notion of technological progress. It essentially defined one of the two key concerns of modern environmentalism – the limits to human control over nature. The other key concern being a global environmental crisis unfolding within the limited ecological space of planet earth; *"the possibility of making the planet unfit for life. Hitherto, people have known that they could do local damage. They could farm carelessly and lose topsoil or deforest or overgraze or mine out a mineral. They also contrived to live through major natural disasters – earthquakes, tornadoes, ice ages. But nobody thought that the planet itself could be at risk"* (Ward, 2003:4). The restricted ecological space of the planet presents the limits within which humans can exploit nature for their own purposes.

Initially, the emerging environmental movement operated on the fringes of the mainstream development policy debate, receiving far more attention in the North than in the South. In fact, many governments and civil society groups from the South were deeply hostile to environmentalism, fearing it will wreck their legitimate desire for development. Growing awareness has changed the international discourse irrevocably, drawing environmental concerns into the mainstream. Amongst the many global environmental concerns, climate disruption has caught the attention of the world.

2.4.1. GLOBAL CLIMATE DISRUPTION

Climate change has long-since ceased to be a scientific curiosity, and is no longer only one of many environmental concerns. Rather it has become the material of rock concerts, TV talk shows and so forth. The United Nations Environmental Programme (UNEP) describes it as *"...the major, overriding environmental issue of our time, and the single greatest challenge facing environmental regulators. It is a growing crisis with economic, health and safety, food production, security, and other dimensions"* (UNEP, 2009:unnumbered). Changes to the climate are emerging so quickly, with such large-scale impact, that some commentators prefer the term climate disruption to climate change.

Over the last ten thousand years the planet's average surface temperature has been around 14^{o}C; a temperature which suits our species superbly. According to the eminent scientist, Tim Flannery (2005:5) *"...we have been able to organise ourselves in a most impressive manner – planting crops, domesticating animals and building cities. Finally, over the past century, we have created a truly global civilisation."* For all the benefits of this remarkable development progress, human activity has caused major damage to the planet. Even though initially there were much opposition to the notion that human activities are *"changing the composition of the atmosphere and its properties"* (Stern, 2006:3), the debate seems to be settled.

Since the industrial revolution the composition of the atmosphere has been altered significantly. The term greenhouse gasses (GHG) has been coined to aptly describe gasses in an atmosphere that absorb and emit radiation within the thermal infrared range, causing the greenhouse effect. The greenhouse effect influences the planet's temperature; without which the average surface temperature would have been about 33^{o}C lower. Many greenhouse gasses are in some way or another generated by human activity. Although scarce, and weak in its capacity to capture heat, *"CO_2 is very long-lived in the atmosphere: around 56% of all the CO_2 that humans have liberated by burning fossil fuel is still aloft, which is the cause – directly or indirectly – of around 80% of all global warming"* (Flannery, 2005:28).

The fact that a known proportion of CO_2 remains in the atmosphere allows us to calculate a carbon budget for humanity. Prior to 1800, the start of the Industrial Revolution, there were about 280 parts per million (ppm) of CO_2 in the atmosphere, which equates to around 586 gigatonnes of CO_2. Today

the figures are 380 ppm or around 790 gigatonnes (Flannery, 2005: 28). A level double that which existed prior to the industrial revolution (560 ppm) is considered the threshold of dangerous change. To avoid crossing this threshold, we must limit all future human emissions to around 600 gigatonnes, of which just over half will stay in the atmosphere. Limiting all future emissions in this way will raise CO_2 levels to around 1100 gigatonnes, or 550 ppm by the end of the century. This will be very difficult to achieve, since it will allow humans to only emit 6 gigatonnes per year over the next century. Throughout the 1990s we emitted an average of 13.3 gigatonnes of CO_2 per year, with carbon concentrations rising by 2.3 parts per million per year.

The current level of atmospheric greenhouse gas concentrations is the highest in at least 650 000 years. The predominant reasons are burning of fossil fuels, deforestation and other changes in land-use, accompanied by rising concentrations of other greenhouse gasses, particularly methane and nitrous oxide.

The result of this build-up in atmospheric greenhouse gas concentration is an increase in global mean surface temperatures over the past century, warming by 0.7°C since 1900. *"Over the last 30 years, global temperatures have risen rapidly and continuously at around 0.2°C per decade, bringing the global mean temperature to what is probably at, or near, the warmest level reached in the current interglacial period, which began about 12,000 years ago. All of the 10 warmest years on record have occurred since 1990"* (Stern, 2006:5). *"Climate change is a serious and urgent issue. On current trends, average global temperatures could rise by 2 - 3°C within the next fifty years or so, with several degrees more by the end of the century if emissions continue to grow"* (Stern, 2006:58). Even based on conservative models, the planet may reach temperatures not seen since the middle Pliocene era - around 3 million years ago. The level of warming on a global scale is far beyond the experience of human civilisation.

Greenhouse gas emissions are driven by economic growth; per capita CO_2 emissions have been strongly correlated with per capita GDP. It represents the *"greatest and widest-ranging market failure ever seen"* (Stern, 2006:i), presenting a unique challenge to mankind. Since it is global in its causes and consequences, international collective mitigating action is required in setting and regulating targets for change, but also in *"creating price signals and markets for carbon, spurring technology*

research, development and deployment, and promoting adaptation, particularly for developing countries" (Stern, 2006:i).

Even though the consequences of climate disruption are global, the impact is not evenly distributed. As a result of their geographical disadvantage, poor developing countries will be affected earlier and more severely than rich countries. In addition, the poor are heavily dependent on subsistence agriculture, the most climate sensitive of all economic sectors. Low incomes and vulnerabilities complicate adaptation to climate change. *"Stern calculated that a 2°C rise in global temperature cost about 1% of world GDP. But the World Bank ... now says the cost to Africa will be more like 4% of GDP and to India, 5%"* (Economist, 2009(b):63). The predicted 2°C rise in global temperatures may result in acute water shortages, food shortages resulting from lower global agricultural production, sea level rise of at least one meter, and the loss of one third of the world's species, creating hundreds of millions of environmental refugees (South Centre, 2007:6). Interventions to limit global warming to an increase of 2°C would cost $140 billion to $675 billion per annum according to World Bank calculations (Economist, 2009(b):64). It is unclear at this stage how these interventions will be financed, especially in the developing world.

2.5. MEASURING SUSTAINABLE DEVELOPMENT

Despite the fact that sustainable development has become a widely used concept, the measurement thereof is relatively underdeveloped. If the concept of inter-generational equity is central to the notion of sustainability, the *"way to achieve this is by passing on to future generations a level of capital that is at least as high as ours today"* (Ruta & Hamilton, 2007:45). The measurement of sustainability would then be similar to an accounting process with capital being the object measured. Sustainability then would depend upon the *"maintenance of a non-declining level of a number of ecological, social and economic indicators"* (Ruta & Hamilton, 2007:46).

Traditionally, development progress typically measured well-being as approximated by income. Sustained well-being will require that the quantity of goods and services produced in an economy should not decline from one year to the next. Growth of income is important to address social goals

such as poverty alleviation. Income measures, however, do not say much about sustainability; higher income does not mean 'higher' sustainability. Samuelson (1961:50) argued that a better measure of well-being would be wealth instead of income, in which case sustainability can be measured in terms of changes in wealth. Wealth would include all the assets needed for the generation of well-being. Three categories of capital assets are generally acknowledged, from which goods and services are derived that are needed to maintain or improve well-being:

- Natural capital refers to the *"natural resources (matter and energy) and processes that are needed to maintain life and produce and deliver goods and services"* (Hanks *et al*, 2005:3). It includes renewable resources (such as freshwater, fisheries and wood), non-renewable resources (such as mineral deposits), sinks and ecological processes such as climate regulation.
- Intangible capital refers to assets generally unaccounted for in wealth estimates. It includes human capital, which refers to the *"skills and know-how embodied in the labour force"* (Ruta & Hamilton, 2007:52). It also includes people's *"health, motivation and capacity for relationships, all of which are necessary for productive work and the creation of a better quality of life"* (Hanks *et al*, 2005:3). Human capital is a renewable resource which can be fostered through improving opportunities for learning, creativity, stimulation and enhanced health. Social capital concerns *"the amount of trust among people in a society and their ability to work together for common purposes"* (Ruta & Hamilton, 2007:52). It refers to the *"institutions that help maintain and develop human capital in partnership with others"* (Hanks *et al*, 2005:3), including families, communities, businesses, trade unions, schools and voluntary organisations. The final element of intangible capital refers to the governance structure. An economy with an efficient judicial system, clear property rights and an effective government will generally be wealthier than those without.
- Produced capital includes physical capital - material goods or fixed assets *"that contribute to the production process or the provision of services, rather than being part of the output itself"* (Hanks *et al*, 2005:3); as well as financial capital. Financial capital plays a critical role in the economy, enabling the other types of capital to be owned and traded. Unlike the other types

of capital, it has no intrinsic value itself but is only representative of the value of other capital assets.

The crisis of sustainability results from the fact that current production and consumption patterns are depleting stocks of natural and intangible capital, while adding disproportionately and unevenly to produced capital. Looking at comprehensive wealth creates a better framework for the creation of well-being in an economy, reviving the ideas of classical economists.

Since sustainable development is a multi-dimensional concept involving many different disciplines, it would be possible to approach it, and the measurement thereof, from many different angles. Traditionally sustainable development has been viewed as the intersection of the social (intangible capital), economic (produced capital) and environmental (natural capital) spheres as illustrated in figure 2.4. The well known 'triple bottom line' followed this approach. This view is extremely limited and do not facilitate solving the measurement problem. Each sphere brought its own 'language', priorities and challenges, making it difficult to find commonality.

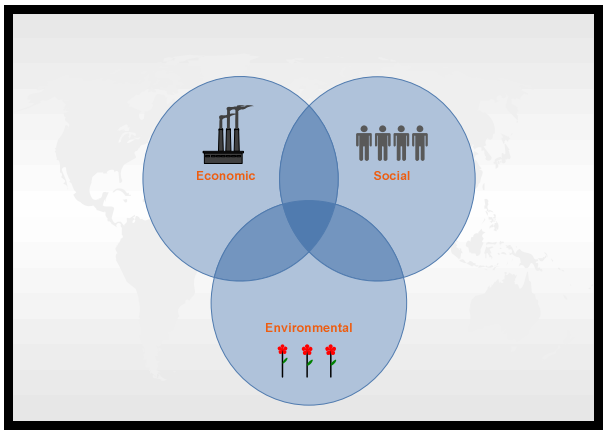


Figure 2.4 | Traditional View on the Dimensions of Sustainability

An alternative perspective, as illustrated in figure 2.5, integrates the spheres, recognising that human activity is dependent on the environment, with economic activity being a subset of human activity.

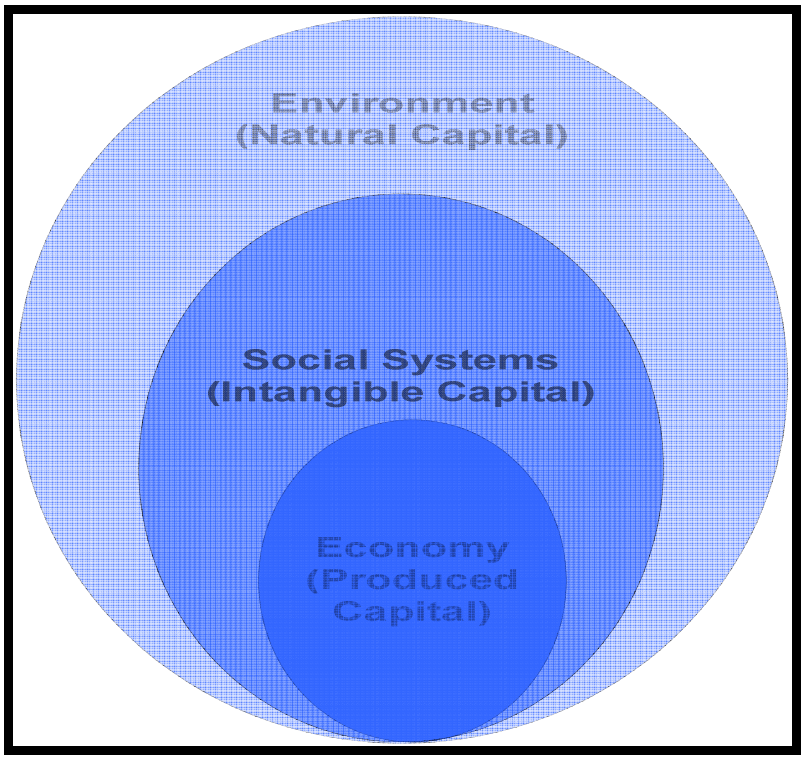


Figure 2.6 | Alternative View on the Dimensions of Sustainability (Source: Adapted from Mebratu, 1998:137)

2.6. APPROACHES TO SUSTAINABLE DEVELOPMENT

The difficulty in finding a satisfactory definition for sustainable development and merging emotive, urgent and what may seem like opposing issues, makes it clear that not only is sustainability a highly complex moral notion, but also a highly contestable political concept (Hattingh, 2001:21). While it may seem like everyone agree in broad outline on the core notions of the concept, a political and ideological battle exists between different conceptions of sustainable development.

From a brief historical overview it is clear that from the start there were two opposing positions. On the one side there was recognition of the serious impact of current unsustainable patterns of development on the environment (limits), while on the other there was recognition of the needs of the poor, calling for more development to lift them out of their misery (Mebratu, 1998:493-503). While these two positions remain, the debate has become more complex. The different interpretations of

the concept occur along what Hattingh (2001:21) calls fault lines representing internal tensions within the concept of sustainable development itself. On each one of these fault lines two principally opposing and competing ideological positions of sustainable development can be found, with a continuum of possible positions between these polar extremes (illustrated in figure 2.6).

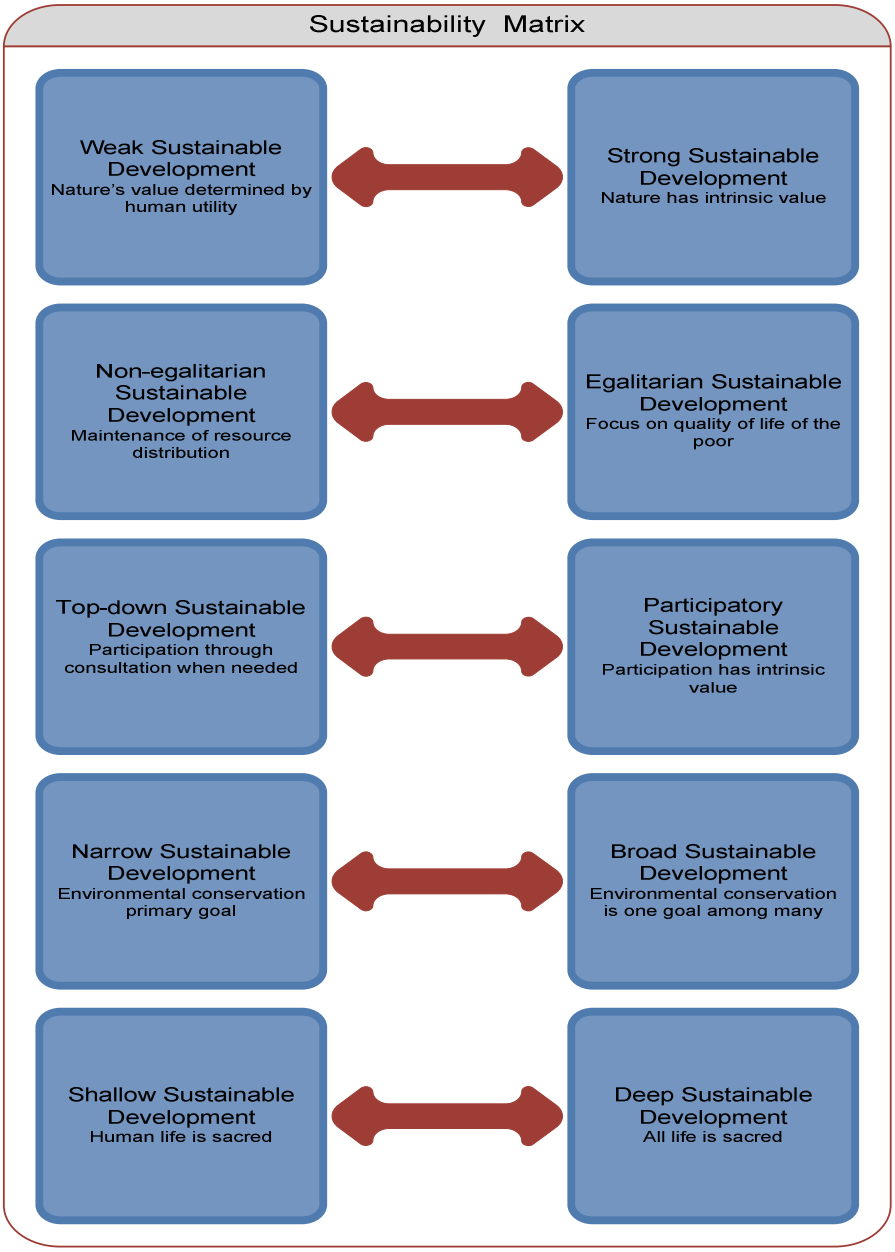


Figure 2.6 | The Sustainability Matrix (Source: adapted from Hattingh, 2001)

2.6.1. WEAK OR STRONG

The real issue according to Hattingh (2001:10) in the debate on a weak and a strong interpretation of the concept of sustainable development, is how much of nature needs to be conserved in order to achieve sustainability. It essentially places anthropocentrism and ecocentrism in confrontation with each other, mimicking the classical tension leading to the birth of what some would call 'the compromise' - sustainable development. Anthropocentrism emphasises weak sustainability; ecocentrists stress strong sustainable development.

Essentially the debate is on the relative value of different types of capital and the substitutability thereof. Anthropocentrists claim that the different types of capital are perfectly intersubstitutable. Thus a fall in one - usually natural capital - can be justified by a rise in another - usually produced capital. This substitutability is assumed to be almost infinite. The only goal would be to *"maintain total capital intact without regard to its composition…"* (Goodland & Daly, 1996:1006). Natural capital is important because of the value it adds for humans. Economic activity should not be limited by predetermined environmental constraints. Environmental protection is only possible where it is economically viable and affordable. Anthropocentrism inspires some economists who, in the debate on climate change mitigation, argue that *"...mitigating climate change means spending real money now in exchange for uncertain benefits in a remote future"* (Economist, 2006(b):14), making the 'investment' unviable.

The logical conclusion of the weak interpretation of sustainable development is that the total existing capital stock could be converted into produced capital and still be seen as sustainable. Even though many economists believe that weak sustainability is good enough, it does not recognize the *"unaccounted ecological services and life-support functions performed by many forms of natural capital and the considerable risk associated with their irreversible loss"* (Wackernagel & Rees, 1996:37).

On the other hand strong sustainability would require different types of capital to be managed and maintained separately. It assumes that *"natural and human-made capital is not really substitutes but compliments in most production functions"* (Goodland & Daly, 1996:1006). This approach emphasizes a strong commitment to living within the carrying capacity of the biosphere and

recognizes that nature has intrinsic value, irrespective of its value to humans. Economic activity should not go beyond the limits of nature's carrying capacity. One way of achieving strong sustainability is to limit the ecological footprint of an area and then to measure and manage impact (Wackernagel & Rees, 1996:53).

2.6.2. EGALITARIAN OR NON-EGALITARIAN

Two dimensions of sustainable development can be distinguished – intergenerational justice and intragenerational justice. Intragenerational justice considers the distribution of resources between rich and poor countries, while intergenerational justice considers the distribution of resources between present and future generations (Hattingh, 2001:12). This notion of justice reveals a set of fault lines that has been defined as egalitarian and non-egalitarian sustainable development.

A non-egalitarian interpretation of sustainable development is mostly concerned with sustaining current patterns of resource distribution and the maintenance of the current relative standards of living. This implies preserving the prevailing economic relations between rich countries and poor countries. There is a preference to emphasise the conservation of nature and resources, especially those located in poor countries.

Commentators of a non-egalitarian interpretation generally make no or minor reference to national or global resource distribution and apparently do not see the inequality in distribution patterns as a matter for concern. They often argue that population growth – much higher in the South than the North - is more relevant to environmental damage than consumption levels. This argument implies that poor countries should take the blame for environmental degradation, even though rich countries are responsible for the bulk of global resource consumption and emissions. At the same time Northern dominated global institutions and agreements seek to perpetuate and even widen global inequalities. This principle is further entrenched and institutionalised in the Kyoto Protocol, which as McLaren (2003:26) points out, assumes a distribution of emissions rights proportional to current rates of use, implying that the unequal distribution patterns must be perpetuated.

An egalitarian interpretation of sustainable development emphasises the needs of the poor, whether they are individuals, communities or nations. Efforts would be directed at raising the living standards of the poor, with an accompanying redistribution of resources to ensure equitable access. There is strong support for the reduction of consumption of global resources by the rich North, since it is recognised that it is not possible to create global consumption equilibrium at the rates currently found in those countries. Practically the ecological footprint of the North should be reduced to not invade the ecological space appropriated by the South - a radical departure from current patterns.

In reality the political debate is still focussed on whether international inequalities should be reduced and not on how it should be done. A reason for this is that economists assume that since a measure of inequality at a national level can be justified, it should also be justifiable at an international level. There is no evidence for the relevance of this assumption (McLaren, 2003:26).

How should a state of *"just sustainability"* (McLaren, 2003:22) be reached? Several approaches have been proposed to give effect to the notion of justice in sustainability; amongst others the carrying capacity of natural systems combined with the global measurement of environmental space. This is a *"rights-based approach that conceptualizes sustainable development in terms of access for all to a fair share in the limited environmental resources on which healthy quality of life depends. It implies eliminating at least international inequalities in aggregate resource consumption as well as inter-generational ones"* (McLaren, 2003:25).

A major problem according to McLaren (2003:27) is that equity-based strategies challenge vested interests in the international system – particularly multi-national companies and their shareholders, who benefit most from them. Compounding the problem is that reducing Northern consumption may actually threaten Southern well-being further, because of the dependence of Southern economies on the export of commodities. Yet Sachs (2000:17) argues that *"it is high time to concentrate the spotlight on the structural inequities that trap the majority of people around the globe into miserable and undignified living conditions."*

2.6.3. TOP-DOWN OR PARTICIPATORY

The debate between the top-down and the participatory interpretation of sustainable development is essentially one of process – the way development interventions are designed and implemented. On the one hand there is a commitment to full participation, which is promoted as something with intrinsic value. On the other hand a top-down, stakeholder interpretation of sustainable development sees participation as something with instrumental value. Although there will always be an element of participation in any development programme, what is at issue here is the significance of the participation process to the development strategy (Hattingh, 2001:15).

Public participation is an elusive concept which acts as an umbrella term for a new style of development planning intervention (Theron, 2005:113). Although it is impossible to suggest a development strategy or intervention which is not in some way 'participatory', it does not mean that development strategists, policy-makers or the public agree on what participation is and how it should be implemented.

A top-down approach views development as a process in which the public remain the recipients of resources allocated in a top-down blueprint fashion (Theron, 2005:111). Although participation is accommodated in this process, where it is not required, it is not espoused. Participation is typically only required for the implementation - not for the setting of objectives – of a development intervention. However, when participation is required to determine objectives, it usually takes the form of consultation. In these consultative processes, participation usually is restricted to the major stakeholders of society - academics, specialists, business leaders, and representatives of local government and large organisations (Hattingh, 2001:15).

An alternative vision argues that through participation people are enabled to determine and control the allocation of development resources, not merely influence its direction (Theron: 2005:111). People-centred participatory sustainable development promotes the idea that participation has an intrinsic value. Full participation, which promotes the empowerment of people and communities, is therefore a good in its own right. In this context participation is relevant for objective setting and the implementation of plans. Maximum involvement of stakeholders, including ordinary members of the public, community organisations and grassroots groups are encouraged and facilitated.

According to Rahman (as cited in Theron, 2005:114) these issues *"…belong to the view of public participation as the exercise of people's power in thinking, acting and controlling their action in a collective framework."* Participation should then lead to self-reliance. This is based on Paulo Freire's formulation of the principle of critical consciousness from the early 1970's, which contributed greatly to the early body of knowledge regarding participatory development.

Table 2.1 | Top-Down and Participatory Interpretations of Sustainable Development

Top-down (Participation as a means)	Participatory (Participation as an End)
Participation is 'used' to achieve a predetermined goal or objective.	Aim is to empower people to have a meaningful stake in their own development.
Attempt to use existing resources to achieve programme objectives.	Attempt to ensure increased role of people in development initiatives.
Focus is on achieving the objective.	Focus on improving the ability of the people to participate rather than just on achieving objectives.
Common on Government programmes aiming to mobilise the community to improve the efficiency of the delivery system.	NGOs usually agree with this approach at least in principle.
Participation is generally short-term.	Participation is a long-term process.
Passive form of participation.	Participation is more active and dynamic.

Source | Adapted from Oakley (1991) as cited in Theron, 2005:117

2.6.4. NARROW OR BROAD

The debate relating to a narrow or a broad interpretation of sustainable development essentially deals with scope. In this debate the central question is whether the protection of the environment is the over-riding objective of sustainable development, or is it only one among a set of equal objectives?

Devotees of a narrow interpretation refer to the sustainability of the ecological system primarily, even if it means the displacement of the human component (Gallopin, 2003:14-15). They value ecological sustainability above and beyond, rather than equal or subordinate to, economic and social sustainability. A narrow interpretation emphasises the protection of the environment and sees the

process of sustainable development as primarily the maintenance and growth of the natural capital stock (Goodland & Daly, 1996:1005).

In contrast, a broad interpretation of sustainable development recognises the importance of environmental protection, yet views it as only one goal amongst many others equal to it. Sustainable development is much wider than the environmental agenda and in fact describes a new goal for economic, social and political life. Advocates argue that the only option to safeguard the environment in the long-term is to seek the sustainability of the whole socio-ecological system. A socio-ecological system is *"…any system composed of a societal (or human) component (subsystem) in interaction with an ecological (or biophysical) component"* (Gallopin, 2003:14-15). The rationale for considering the whole system is based on the existence of important inter-linkages between society and nature.

Broad sustainable development is the more modern approach. Already the World Conservation Strategy of 1980, which for the first time referred to the notion of 'sustainable development', shifted the locus of sustainability from nature to development. While sustainability previously referred to living resources it now refers to development (Sachs, 2000:14).

2.6.5. DEEP OR SHALLOW

At the heart of the debate between proponents of the deep ecology and shallow interpretations of sustainability is the question: are all species equal and does nature have intrinsic value, or is nature only valuable to the extent that it provides goods and services to humans, who are the superior species?

Shallow interpretation of sustainable development holds that humans are exceptional and that nature is only a resource for humans to exploit. Thinkers in this context describe life as mechanical, and nature as knowable, explainable and predictable. There is therefore no spiritual significance in the way life and nature works. It is essentially a modernistic world view in line with Western scientific tradition. The shallow interpretation is complimentary to weak sustainability and would probably be in conflict with egalitarian thinking.

The deep ecological view questions western reductionist views on the environment and tries to promote a new ethic where existing values are replaced with new ones and with the emphasis on new behaviour patterns (Treurnicht, 2000:66). Essentially a deep ecological approach to sustainable development holds that life is sacred; humans are part of a bigger whole. Nature does not belong to humans, but we merely act as caretakers.

James Lovelock, after discovering the self-regulating processes of the atmosphere, named it Gaia after the Greek goddess of the earth. Gaia essentially refers to the Earth as a *"…whole living being… (It) No longer is a dead rock we live upon, the Earth is a living process in which we participate. Earth, as a home for life, is a being that we can both harm and help to heal"* (Macy & Brown, no date: 44).

While these ideas have developed into the deep ecology platform, Macy and Brown (no date:47) argues that deep ecology is neither an ideology nor a dogma, but is rather about exploring the questions around people's real wants and needs, their relation to life on Earth and their vision for the future. *"As parts of a larger living whole – be it a society, an ecosystem, or a planet – our comprehension of it is necessarily partial; we cannot stand aloof, blueprints in hand, and deliver final answers"* (Macy & Brown, no date:47). *"The atmosphere, Lovelock concluded, is Gaia's great organ of interconnection and temperature regulation. He described it as not merely a biological product, but more probably a biological construction: not living, but … an extension of a living system designed to maintain a chosen environment"* (Flannery, 2006:13).

According to Flannery (2006:17), someone who believes in Gaia sees everything on Earth as being intimately connected to everything else, just as are organs in a body. In such a system, pollutants cannot simply be shunted out of sight and forgotten; species' extinction is seen as an act of self-mutilation. As a result, a Gaian world view predisposes its adherents to sustainable ways of living. In our modern world, however, the reductionist world view is in the ascendant, and its adherents often see human actions in isolation. It is this reductionist world view that has brought the present sustainability crisis upon us.

Devall (2001:23) identified amongst others, the following principles that constitute the deep ecology platform:

- *"Humans have no right to reduce this richness and diversity except to satisfy vital needs.*
- *Present human interference with nonhuman world is excessive, and the situation is rapidly worsening.*
- *Policies must therefore be changed. The changes in policies affect basic economic, technological and ideological structures. The resulting state of affairs will be deeply different from the present.*
- *The ideological change is mainly that of appreciating life quality (dwelling in situations of inherent worth) rather than adhering to an increasingly higher standard of living. There will be a profound awareness of the difference between big and great."*

The emergence of the new environmental age provided new possibilities of questioning traditional religions, specifically the Judeo-Christian traditions (Mebratu, 1998:508-509). This gave rise to the appearance of eco-theology, which attempts to reinterpret these old traditions according to the new reality. Contemporary eco-theology articulates the *"…sorrow of a broken-hearted Earth, expresses our despair over the past, and fear for the future"* (*ibid*:508). It is based on the belief that the ecologically relevant material in the religious texts and traditions has simply been ignored. Therefore, if humans would allow themselves to be shaped by true religious virtue, it will rebalance the relationship between humans and nature.

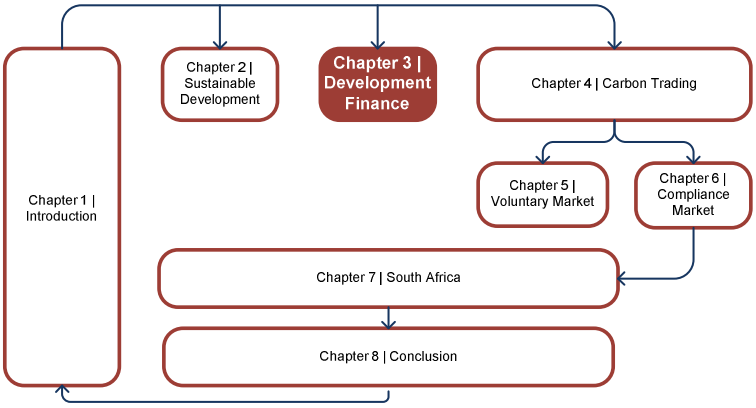
2.7. CONCLUSION

There are huge disparities in the world consequent to the concentration of resources in the global elite, mostly resident in countries of the North. They have managed to build their stock of produced and intangible capital relatively 'cheaply', in an era when *"...natural capital was considered infinitive relative to the scale of human use"* (Goodland & Daly, 1996:1005). The conventional Northern model of economic development, which emphasises growth in the gross domestic product of states by increasing per capita consumption and productivity, combined with population growth, have put an end to the era of 'cheap' natural capital.

Over-use of environmental resources is at the heart of the challenge of sustainable development. Humans are consuming and wasting resources at a rate faster than the ecological systems of the planet can tolerate. Substantial cuts in resource use and emissions are required to deliver inter-generational equity. But this also will have dramatic implications for intra-generational equity. Where there are limited resources, distributional questions cannot be avoided; *"current economic inequality and the marginalisation of the poor by the wealthy also drive resource exploitation…Thus inequality is a driving force behind unsustainability"* (McLaren, 2003:21). The social dimension of sustainability is therefore inescapable. Goodland and Daly (1996:1009) argue that what is at issue is that of burden sharing. The Global North is responsible for the *"…overwhelming share of global environmental damage."*

The environmental crises - and specifically the climate disruption challenge – the world faces, are too serious to ignore and to only focus on 'development'. Climate disruption will have an impact on people's access to food; it will cause water stress, affect our health and well-being, and change the environment in which we live. All of these are serious developmental issues. Those who will be affected first and the hardest, are the poor in those countries which contributed least to the problem and who are least able to afford the costs of adaptation.

Climate disruption is only one – albeit arguably the most serious – of many environmental disasters the world is facing. If it is considered that the environment supports the social and economic spheres of activity and hence the well-being of humans, it is essential to address environmental limits as part of any development and re-development intervention. Such development and re-development interventions must be directed by a strong sense of intra-generational, as well as inter-generational justice.



3.1. INTRODUCTION

The purpose of Chapter 3 is to give a brief overview of the international debate on financing development, and the sources of development finance. This is done by distinguishing between two categories of financial flows – those damaging to sustainability, and those promoting sustainability. Positive flows from both traditional and innovative new sources are discussed.

3.2. BACKGROUND

Even though there is no agreement on how the world should interpret its complex sustainability challenges and the corrective steps to take, there is a continuing debate on financing sustainable development interventions. This financing debate, emerging from the wider debate on development finance, has been on-going for several decades.

Even at the United Nations Conference on the Human Environment, convened in Stockholm in 1972, a fundamental concern was how to finance sustainable development. Fundamental to the debate was the principal of responsibility; more industrialised countries are responsible for the damage done

and the subsequent risks that had arisen, to the environment. The rich industrialised countries are the main beneficiaries of the economic activities that produced these problems, and thus have an obligation to bear the costs of dealing with them. *"This translated into the need for the more industrialised countries to enable ... (developing countries) to incorporate care for the environment into their development and to participate fully in global efforts to protect and improve the environment. Developing countries felt strongly that this support was not to come from existing development aid but should be 'new and additional'"* (Strong, 2003:22-23).

Current climate negotiations again include a difficult debate on financing adaptation and mitigation interventions. *"There is broad agreement that high-income countries will transfer some funds to the developing world to assist specifically with adaptation - and provide separate funding for mitigation. But questions remain about how much financing will be available, its source, how its expenditure will be controlled, and on what basis it will be monitored"* (World Bank, 2009:239).

Rich country governments want climate funding granted to poor countries, to be well targeted to climate mitigation and adaptation, achieving real and measurable reductions in emissions or vulnerability. Donor countries would like to have oversight of these funds, *"particularly in the current tight fiscal climate, where domestic constituencies may have little appetite for sending money overseas. This is particularly true for mitigation finance. Indeed, many high-income countries see public funds as playing a limited role in supporting climate financing in the developing world, instead envisioning that a greater proportion of funds be harnessed through market mechanisms"* (World Bank, 2009:239).

Developing countries would like climate finance to assist them to adjust to, and contribute to, the mitigation of a problem they did not create. Not surprisingly, they do not see climate finance as aid and strongly resist any mechanisms of conditionality.

Policy makers' realisation that the international development finance system (illustrated in Figure 3.1) need to adapt to new challenges has radically changed the context of development finance over the last 20 years. Adopted at the end of the century, the Millennium Development Goals (MDGs) have renewed hope for progress on development and poverty reduction, while creating a focus and an

impetus for searching for new and additional sources of development finance. World leaders agree that they need to revitalise efforts to help unlock and more effectively use all development resources including domestic savings, trade and investment receipts and official development assistance. By treating aid as just one of several finance flows and calling for the private sector to become more involved in development, it *"symbolised a shift in consciousness about international development finance. Indeed, important new actors, including private households, foundations and non-governmental organisations have joined bilateral and multilateral donors in financing development"* (OECD, 2007:11). There are two ways in which to make additional funding available for sustainability interventions – by reducing damaging flows and increasing positive flows.

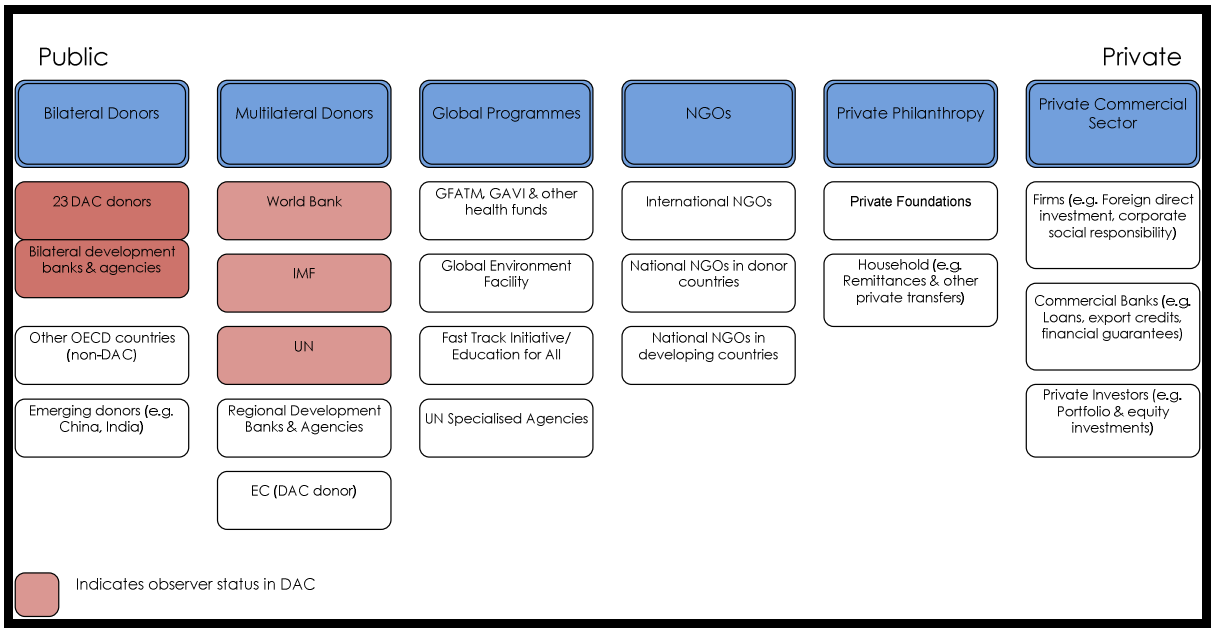


Figure 3.1 | International Development Finance System (Source: OECD, 2007:12)

3.3. REDUCING DAMAGING FLOWS

3.3.1. SUBSIDIES

One way to finance sustainability is *"the redirection of existing financial flows that are both inimical to economic efficiency, narrowly construed, and to environmental progress"* (Pearce, 2007:454). This includes economic input, as well as, output subsidies. A substantial literature has developed on these topics (for example van Beers and de Moor, 2001; Porter, 2002; OECD, 1996; and Milazzo, 1998).

Essentially subsidies involve *"deadweight losses of well-being regardless of any environmental effects. Once the latter are brought into consideration, the scale of the combined inefficiency can be substantial"* (Pearce, 2007:454). In addition, subsidies often do not, contrary to initial expectations, benefit the poor. Even where they are targeted at the poor, middle income groups tend to manipulate the subsidy system to their advantage. *"Subsidies create rents and hence a whole 'industry' emerges which seeks to capture the rents. It is more likely that the powerful will capture the rents, further marginalising the poor"* (Pearce, 2007:454).

Subsidies in agriculture, energy, water and fisheries globally may amount to more than $1 trillion annually (Pearce, 2007:454), of which nearly 70% are in Organisation for Economic Co-operation and Development (OECD) member countries[3]. These subsidies can be seen as *"highly damaging financial flows that finance non-sustainability"* (Pearce, 2007:454). Current annual subsidies are approximately seventeen times the annual flow of official development aid.

Those seeking finance for sustainable development should target subsidies since, some would argue, they damage rich country environments as well as the growth potential of developing countries by restricting or denying access to markets. At the same time, subsidies in developing countries often take up a significant percentage of public expenditure, further inhibiting the provision of public goods.

[3] Thirty countries described as liberal democracies accepting the principles of a free-market economy. Most OECD members are high-income economies and are regarded as 'developed.'

But how realistic is it to expect diversion of existing subsidies into projects and policies consistent with sustainability? Removing subsidies involves losers who have a vested interest in the subsidy regime continuing or even expanding. Since they are probably groups with the *"power to capture the rents arising from subsidy regimes, it follows that removing subsidies is far from easy"* (Pearce, 2007:455).

3.3.2. DEBT REPAYMENTS

A second source of negative financial flows for developing countries, and one in which there have been some progress over the last decade, is debt repayment. The positive impact thereof on development is primarily two-fold. First, debt repayments are made from the exchequer with funds that should have been used for the provision of public goods in the indebted country, hence investment suffers. Second, debt has to be repaid in hard currencies[4], forcing the indebted country to earn foreign exchange to repay its debt. The options for poor countries to earn foreign exchange are limited, thus often forcing it to exploit and export natural resources in an unsustainable manner.

In addition to bilateral debt relief efforts, the International Monetary Fund (IMF) and the World Bank administers a programme – the Heavily Indebted Poor Countries (HIPC) Initiative – providing debt relief and low-interest loans to service external loans. A group of 40 countries qualified for the HIPC programme (see figure 3.2 for details). *"The Joint IMF-World Bank's comprehensive approach to debt reduction is designed to ensure that no poor country faces a debt burden it cannot manage. To date, debt reduction packages under the HIPC Initiative have been approved for 35 countries, 29 of them in Africa, providing $51 billion in debt-service relief over time. Five additional countries are potentially eligible for HIPC Initiative assistance"* (IMF, 2009(a):unnumbered).

[4] A globally traded currency that can serve as a reliable and stable store of value, including the US dollar, euro, Swiss franc, British pound sterling, Norwegian kroner, Swedish krona, Canadian dollar, Japanese yen and the Australian dollar.

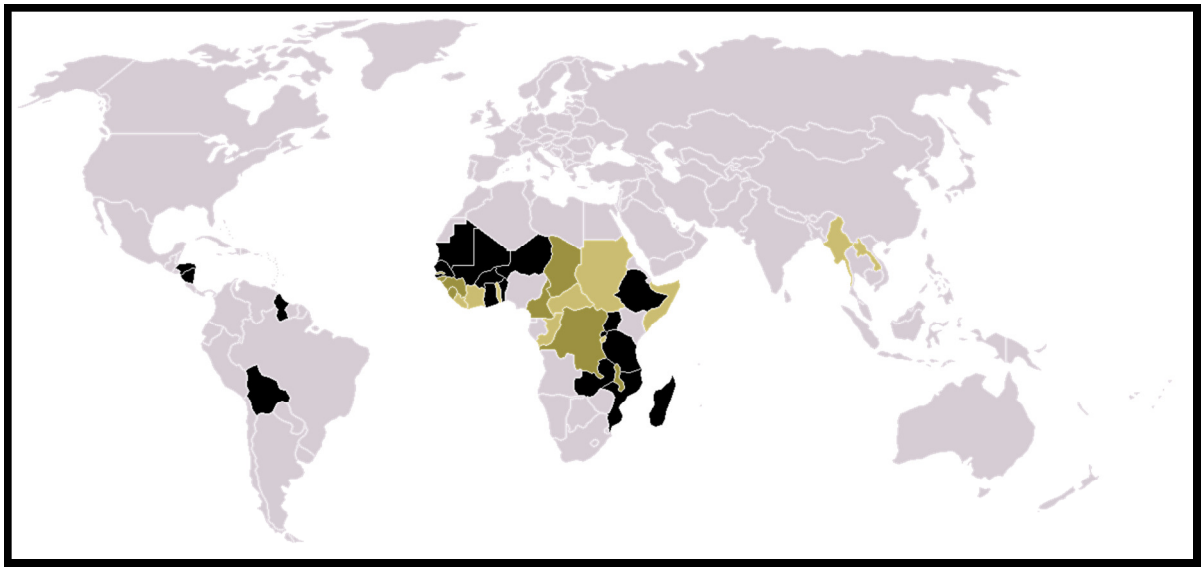


Figure 3.2 | Countries Participating in the HIPC Programme (Source: Wikipedia, 2009(b):unnumbered) (Legend: Black - full relief, brown - partial relief, green - eligible, but do not meet necessary requirements)

In addition to the HIPC the IMF initiated a second programme - the Multilateral Debt Relief Initiative (MDRI) – which *"provides for 100 percent relief on eligible debt from three multilateral institutions to a group of low-income countries. The initiative is intended to help them advance toward the United Nations' Millennium Development Goals (MDGs), which are focused on halving poverty by 2015"* (IMF, 2009(b):unnumbered). To date $3.35 billion have been spent on the MDRI.

3.4. CREATING POSITIVE FLOWS

3.4.1. OFFICIAL DEVELOPMENT AID

Official Development Aid (ODA) is a statistic compiled by the OECD to measure aid by the members of its Development Assistance Committee (DAC)[5] and is widely used as an indicator of international aid flow. Development aid remains essential in international development policy. According to Radelet (2006:7), most development aid is designed to either stimulate economic growth, strengthen provision of social services and other public goods, support subsistence consumption of food and other commodities, or to help stabilise an economy following economic shocks.

Although direct private investment flows, from rich countries to poor countries, are more than ODA flows, *"(ODA) remains the dominant source of foreign investment in many of the poorest developing countries"* (OECD, 2004:14). Private investment will generally be guided by market rates of return, and therefore have their justification in terms of conventional commercial criteria. Development aid flows are *"directed at the provision of public goods and services. These public goods are integral to sustainability, including as they do, infrastructure, water, education, health, power generation and the environment"* (Pearce, 2007:456).

Between 1960 and 2004, DAC countries gave nearly $650 billion in aid (2004 prices) to Sub-Saharan African countries (Sundberg & Gelb, 2006:1). After declining throughout the 1990s, ODA has increased since the turn of the century. The OECD reports an increase of aid to $119.8 billion in 2008, its highest level ever (OECD, 2009:unnumbered). This represents a real increase of 10.2% from the previous year. Only five nations (see figure 3.4) exceed the United Nations' target of 0.7% of

[5] The DAC is a forum for selected OECD member states to discuss issues surrounding aid, development and poverty reduction in developing countries.

their gross national income (GNI). If the 0.7% target was met, ODA would increase flows to over $190 billion per year (in 2008 dollars) (Pearce, 2007:456).

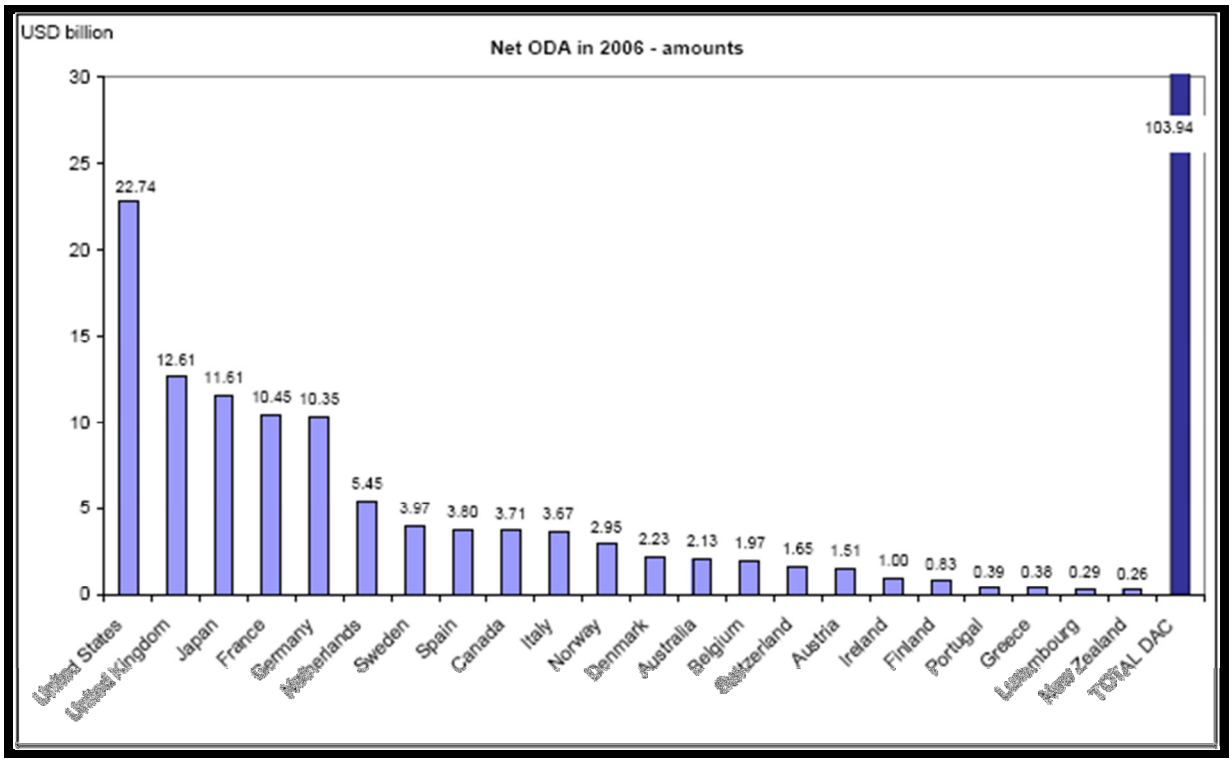


Figure 3.3 | ODA by DAC Countries in Absolute Terms (Source: OECD, 2009: unnumbered)

Although aid is an important source of development funding, Collier (2007:99) argues that it is not enough. Its use is often dysfunctional as a result of the politicised nature thereof. Some on the left see aid as *"some sort of reparations for colonialism"* (Collier, 2007:100). Instead of being a tool in the world's development toolbox it is turned into *"a statement about the guilt of Western society"* (Collier, 2007:100). In this perspective, the only role for the poor is as victims.

On the other hand, observers on the right seem to equate aid with *"welfare scrounging. In other words it is rewarding the feckless and so accentuating the problem"* (Collier, 2007:100). Between these two extremes there is a *"narrow sliver of sanity called aid for development"* (Collier, 2007:100).

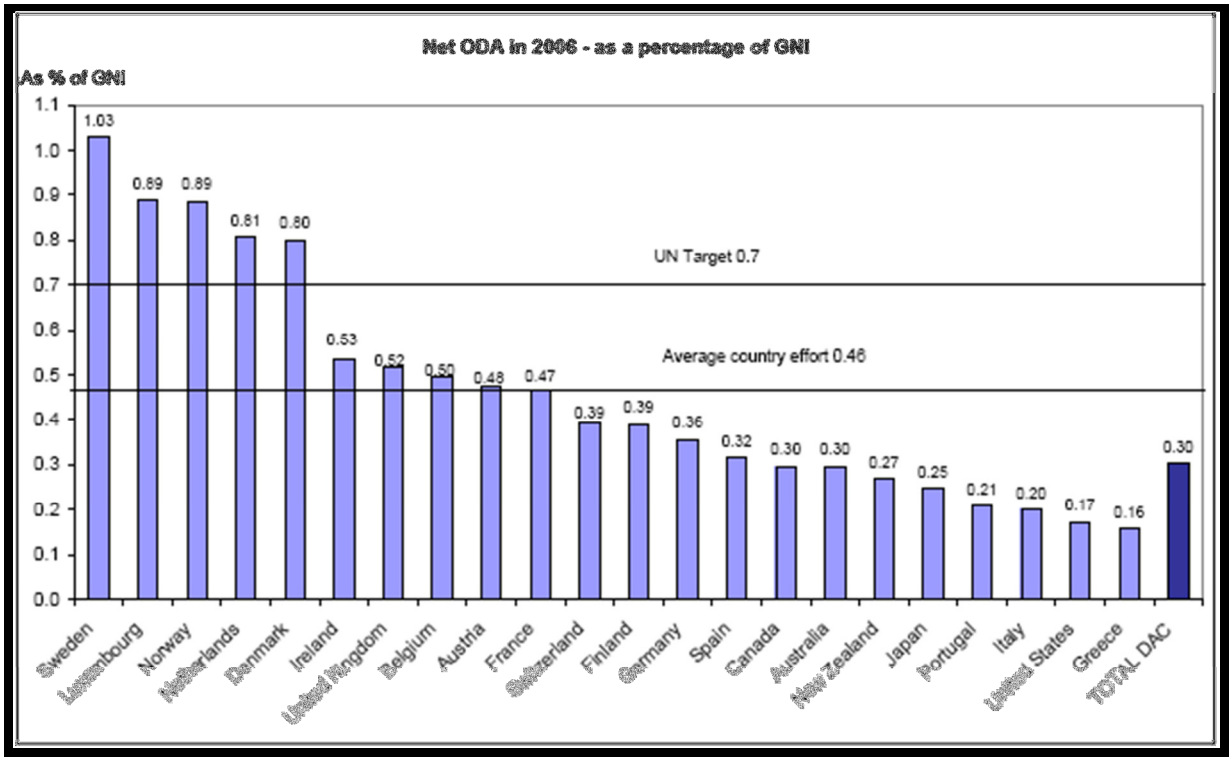


Figure 3.4 | ODA by DAC Countries as a Percentage of their Gross National Income (Source: OECD, 2009:unnumbered)

Evidence seems to suggest that aid does tend to speed up the economic growth process. Collier (2007:100) estimates that aid added around one percentage point to the annual growth rate of the poorest countries. However, it does not follow that with an increase in aid, there would necessarily be a commensurate increase in the growth rate, since aid is subject to the rule of diminishing returns. Research by the Centre for Global Development seems to suggest that when aid reaches about 16% of GDP it more or less ceases to be effective (Radelet, 2006:8). Countries in Sub-Saharan Africa were not far off from that level in 2005. *"We have broadly reached the limits to aid absorption, at least under current modalities"* (Collier, 2007:100).

Table 3.1 | Top Ten African ODA Recipients ($ millions)

		2002	2003	2004	3-year average	% of all recipients
1	Congo, D.R.	1,188	5,421	1,815	2,808	11
2	Tanzania	1,233	1,704	1,746	1,561	6
3	Ethiopia	1,307	1,553	1,823	1,561	6
4	Mozambique	2,203	1,039	1,228	1,490	6
5	Egypt	1,239	988	1,458	1,228	5
6	Ghana	650	954	1,358	987	4
7	Uganda	712	977	1,159	949	4
8	Cameroon	657	900	762	773	3
9	Zambia	641	581	1,081	768	3
10	Madagascar	373	539	1,236	716	3
	Other	11,340	12,125	15,415	12,960	50
	Total Africa	**21,540**	**26,781**	**29,080**	**25,800**	**100**

Source | OECD, 2007:27

Along with the increase in aid, considerable attention has been given to enhancing the effectiveness thereof. There seems to be general agreement *"that aid may well be ineffective if it is not accompanied by 'good' policies"* (Pearce, 2007:456). Many donors including the World Bank and the United Kingdom *"have progressively moved away from individual project funding to Sector Wide Approaches (SWAPs). Here donors contribute to a pool of funding for a sector on the basis of a sector strategy plan. This plan has to be agreed upon with the donors who often actively participate in developing it through their staff or funding consultancies"* (Wallace, 2006:21). However, once appropriate policies are in place *"both the rate of return to those policies and the effectiveness of aid is increased"* (Pearce, 2007:456).

Another way of enhancing effectiveness is through output-based aid (OBA). The Global Partnership on Output-based Aid (2009:1) claims that *"unlike traditional approaches, OBA links the payment of aid to the delivery of specific services or 'outputs.' These can include connection of poor households to electricity grids or water and sanitation systems, installation of solar heating systems, or delivery of basic healthcare services."* The contracted service provider is responsible for 'pre-financing' a project, with aid only paid after the services or outputs have been delivered and verified by an independent agent.

3.4.2. FOREIGN DIRECT INVESTMENT

The contribution of foreign direct investment (FDI) to the development of poor countries is controversial. FDI is seen as a major stimulus to economic growth, through the provision of capital, technical and marketing know-how. Conversely it is argued that FDI does not aid but undermine the process of development through adverse effects on employment, income distribution, and national sovereignty and autonomy. *"FDI can also have adverse balance-of-payments if inputs need to be imported. Foreign reserves can also diminish when profits are repatriated"* (Musila & Sigué, 2006:578).

Generally three types of FDI can be distinguished - extractive, market seeking and export-oriented FDI. Traditionally, Africa attracted extractive and market seeking FDI based on its natural resources and the nature of domestic markets. Market-seeking FDI, however, can lead to *"conflict between private benefits and social benefits, especially if such FDI is protected from competition"* (Musila & Sigué, 2006:579). Extractive FDI is likely to be *"accompanied by high social costs in the form of exploitation of economic rent, negative externalities in the form of pollution, and the exacerbation of inequality through dualistic economic structures"* (Musila & Sigué, 2006:579). As a result, most developing countries seek to attract export-oriented FDI, which is thought to prevent conflict between investors' private benefits and the social benefits to the country. This preference leads to intensive competition among developing countries in attracting such investment and to *"a convergence among*

policy and promotional environments of these countries in pursuit of FDI" (Musila and Sigué, 2006:579).

FDI to Sub-Saharan Africa has grown four-fold in the past decade, reaching an average of $13 billion per annum. As a percentage of GDP, the stock of FDI in Sub-Saharan Africa increased from 10.2% in 1980 to 29.4% in 2004 (World Bank, 2007:275). Despite this growth it lags behind the rest of the developing world in attracting investment, accounting for just 1% of global flows, half the level in 1980. Despite these dismal statistics the OECD reports that *"Sub-Saharan Africa attracts almost as much FDI as a share of GDP as do other developing regions"* (OECD, 2007:24).

Sub-Saharan Africa does not only attract – in absolute numbers - less FDI than other regions, but the type of FDI it attracts do not necessarily contribute to its sustainable development. The primary sector, in particular the exploitation of mineral and petroleum resources, received the bulk of FDI to the region. The twenty four countries in the region classified by the World Bank as oil- and mineral-dependent have, on average, accounted for close to 75% of annual FDI flows over the past two decades (World Bank, 2007:276). FDI inflows only recently began to diversify. Resource-rich countries continued to receive the bulk of FDI, but the reach of FDI flows across Africa is broadening, rising in 40 of the 53 countries on the continent. At the same time there has been *"greater diversification of investment sectors with manufacturing, finance and tourism the key areas of concentration outside the resources sector"* (OECD, 2007:32).

A significant recent development has been the growth of South-South FDI, primarily from Asian countries investing in Africa. Of these, China is the biggest investor on the continent. South Africa has emerged as the second major source of investment, especially in the service and manufacturing industries.

3.4.3. REMITTANCES

Remittances from private households received a lot of attention recently as a significant source of capital to poor countries. Even though some argue that remittances cannot be considered development resources (OECD, 2007:15), the evidence suggests that remittances can:

- *"Reduce poverty, even where they appear to have little impact on measured inequality;*
- *Help smooth household consumption by responding positively to adverse shocks (for example, crop failure, job loss, or a health crisis);*
- *Ease working capital constraints on farms and small-scale entrepreneurs"* (World Bank, 2006:117).

There is also growing evidence that remittances go partly to fund education, nutrition and health (Katseli, Lucas & Xenogiani, 2006**:**23 **;** Cox & Ureta, 2003:23). It is *"an efficient, market-driven means of pushing money towards people who are hard-pressed. Crucially cash is not channelled through non-governmental organisations (NGOs) and civil servants, who absorb (and waste) a big chunk of aid"* (Economist, 2009(a):60).

Despite significant discrepancies in the data, several surveys have shown that in some countries remittances account for 15% or more of GDP and can even be as high as 31%, as in the case of Tonga (World Bank, 2006:90). *"In six Sub-Saharan African countries - Botswana, Côte d'Ivoire, Lesotho, Mauritius, Swaziland, and Togo - remittances were higher than ODA flows. In Lesotho, Mauritius, Swaziland, and Togo, remittances were also greater than foreign direct investment"* (Ratha, Mohapatra & Plaza, 2009:154).

Based on data from governments tracking cross-border flows of money from migrants, as part of their post-2001 anti-terrorist surveillance, the World Bank estimates the 2008 total at $328 billion in remittances (Economist, 2009(a):60). These flows are shown in Figure 3.5.

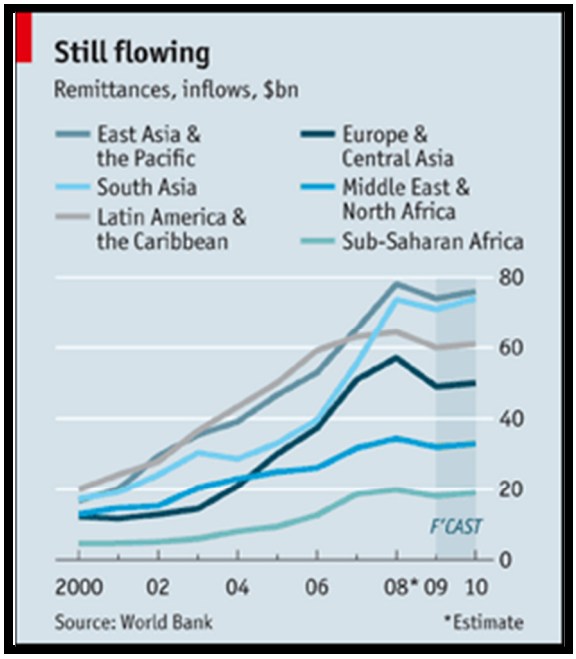


Figure 3.5 | Remittance Flows per Region 2000 - 2010 (Source: Economist, 2009(a):60)

3.4.4. COMPANIES AND FOUNDATIONS

Although their contribution to international development is difficult to quantify, companies and foundations play an increasingly important role. As an example of the size of private philanthropy, according to the International Federation of Pharmaceutical Manufacturers and Associations, contributions from ten companies donating products to the Partnership for Quality Medical Donations amounted to $2.7 billion between 1998 and 2006 (OECD, 2007:15).

Foundations have emerged as significant role-players in global development over the last few decades. Of the many philanthropic organisations active in developing countries, the Bill and Melinda Gates Foundation is perhaps the best known, having committed $20.5 billion in grants by June 2009 (Gates Foundation, 2009:1). In terms of funds spent abroad, the Ford Foundation is the largest American foundation involved in development (OECD, 2007:15).

3.4.5. SPECIALIST FUNDS

Specialist funds have been set up over recent years as public-private partnerships to spark action around specific global challenges such as health and education. Their budgets are now considerable. In the education sector, the 'Education for All Fast Track Initiative' (EFA-FTI) focuses on achieving the education millennium development goal. According to the EFA-FTI (2009:2) it received pledges worth $1.2 billion between 2003 and 2009. The Global Fund to Fight Aids, Tuberculosis and Malaria (commonly known as 'The Global Fund') and the Global Alliance for Vaccines and Immunization ('The GAVI Alliance') operate in the health sector. Up to January 2009, the GAVI Alliance committed $2.6 billion for various programmes globally (GAVI Alliance, 2009:2), while the Global Fund has committed $15.6 billion of which $8.538 billion has been disbursed (Global Fund, 2009:165).

In the environmental sphere the Global Environment Facility (GEF) - a United Nations Agency – initially focused on biodiversity, climate change, ozone layer depletion and 'international water' – seas and lakes shared by two or more nations. It soon took on the role of being the financing mechanism for the Framework Convention on Climate Change, the Convention on Biological Diversity, the Stockholm Treaty on Persistent Organic Pollutants and the Convention to Combat Desertification.

The GEF's *raison d'être* is to assist mainly poor countries in *"financing activities that would be of benefit to the global community but which the relevant countries do not undertake as part of their normal development activities. Put another way, the GEF seeks to internalise the 'global externality' arising from development activity"* (Pearce, 2007:459). Over the last eighteen years the GEF invested $8 billion directly and leveraged an additional $33 billion in co-financing (GEF, 2009:1).

Despite these large volumes, there is uncertainty about whether specialist funds have increased overall flows to poor countries since their funding is still largely composed of conventional bilateral and multilateral ODA. *"Private contributions to the Global Fund constituted only 3% of total pledges in 2004, coming from foundations, multinational companies and private individuals"* (OECD, 2007:15-16).

3.5. SUGGESTED NEW SOURCES OF FINANCE

3.5.1. GLOBAL TAXES

A number of groups favour the creation of global taxes to fund development interventions, arguing that the world needs to finance *"a global public good by imposing a tax on a global public 'bad' – such as hot-money movements, cross-boundary pollution or global arms sales"* (OECD, 2007:71).

"A tax on the consumption of goods that harm the environment has a positive allocation effect, switching spending away from polluting goods towards those causing less or no environmental damage. In these circumstances, switching behaviour is desirable. Moreover, if the revenue is used to reduce other taxes that have a negative allocation effect, we have a double dividend" (Atkinson, 2003:15). According to Atkinson this 'double dividend' can occur in two ways. If revenue is used as an alternative for ODA, it has the potential for efficiency gains as well as a commensurate reduction in taxes used to finance ODA. On the other hand, new revenue may be a net addition to development resources, which may lead to reduced environmental damage while enabling the attainment of stated development goals.

A new tax stream works most effectively if it is easy to collect and difficult to evade. *"It should be neutral in its impact on market incentives and on income distribution unless it is deliberately designed to influence consumption or redistributive wealth. Priority should go to taxes that discourage inappropriate consumption, excessive resource control, environmentally damaging activities and social inequities"* (OECD, 2007:72).

Normally national governments determine the nature and rates of taxation. Taxpayers pay taxes to the government; sometimes taxes are collected by intermediaries. Governments must enforce payment but then is accountable – at least in democracies - to the electorate for the way it uses tax revenue. This complicates global taxation since the same principle – no taxation without representation - cannot be applied.

The question that demands answering is if new revenue sources can generate a positive sum outcome, why have national governments not already adopted this? There may be several reasons for this. A reason may be that the dividend is global rather than national, in which case *"governments may not impose corrective taxes because the benefits accrue disproportionately outside their boundaries"* (Atkinson, 2003:16). Another reason may be due to the political economy of taxation and government finance. The revenue calculations of governments take account only of receipts and payments to the national treasury.

Proposals for global taxes have focussed on three possible types – environmental taxes, currency transaction taxes and global arms sales taxes.

3.5.1.1. GLOBAL ENVIRONMENTAL TAXES

Using a wide definition, the OECD describes environmental tax as *"any compulsory payment to general government levied on a tax base deemed to be of particular environmental relevance"* (OECD, 2007:73). Agnar Sandmo (2005:5-6) argues that a system of global pollution taxes may spawn a 'triple dividend', by making a positive contribution to the global environment, by reducing the efficiency loss of financing public expenditure and by enhancing resources for global development.

Taxes of this nature yielded an average of 2.5% of GDP in OECD member countries in 2000, the bulk of which originated from taxes on transport fuels (OECD, 2007:73). If a uniform tax of more or less €0.01 per litre of fuel is charged, it may yield annual revenue of $130 billion.

"Some pessimism concerning the political realism of introducing such taxes is justified. Carbon taxes have also been opposed as allegedly regressive, hurting lower-income families" (OECD, 2007:73).

3.5.1.2. CURRENCY TRANSACTION TAXES

Some groups, in particular the 'Stamp out Poverty' coalition, promote the introduction of a so-called 'Tobin tax' to raise revenue for global development. Proposed by James Tobin in 1972 as a way to

overcome market volatility, it suggests penalising short-term speculation in global currency transactions by adding a surcharge to each transaction. Its appeal lies in the fact that a very small tax rate (suggestions range from 0.01% to 1%) imposed on a large tax base - the foreign exchange market (average of $250 trillion per annum) – may yield sizable revenues.

Tobin taxes are problematic, since it is *"divorced from activities that contribute to non-sustainability. Currency transactions are either counterparts to real transactions which are likely already to attract an element of externality tax, or they are designed for arbitrage and a smooth functioning of financial markets. There is no obvious link to activities detrimental to sustainability and hence no link to the polluter pays principle"* (Pearce, 2007:457). Essentially it is problematic to argue that foreign exchange transactions contribute to non-sustainability, while in fact the converse seems to be true, in which case 'Tobin tax' becomes *"a tax on sustainable development, not a tax to deliver sustainability"* (Pearce, 2007:457).

It will also be difficult to prevent tax avoidance through the possible relocation of foreign-exchange markets to tax-free jurisdictions. Relocation to tax havens could occur unless all jurisdictions with major market turnover adopted the tax. Coordinated adoption will be difficult to achieve.

3.5.1.3. GLOBAL TAXES ON ARMS SALES

Global arms sales reached $1.3 trillion in 2007 (Erwin, 2008:1). Sales taxes could therefore potentially make a significant contribution to development. A major limitation is that *"the legal and documented arms trade is tax-elastic"* (OECD, 2007:76). In addition there is a *"high risk that taxation of documented trade would stimulate illicit trade"* (OECD, 2007:76). This effect is illustrated in the results of arms trade embargoes against several countries. *"A UN report on arms transfers to embargoed Liberia during the summer of 2002 demonstrates the depth and comprehensiveness of lawbreaking"* (OECD, 2007:76).

3.5.2. GLOBAL LOTTERY

Various proposals to establish a global lottery to fund development interventions have been around since the early 1970s. According to McQueen (2008:1), the total size of world lottery sales was $230 billion in 2007. The amount potentially available for global development interventions would be dependent on the total generated by new lottery operators and their rate of success in capturing spend from existing lotteries. In typical lotteries operated in the United States, 50% of earnings are distributed to winning players, 20% to administration and 30% to beneficiaries. If the same distribution profile is retained for global lotteries, a substantial amount could be generated for development projects.

There are several concerns around the establishment of global lotteries. They *"may face political opposition if they are seen to take money away from national charities"* (OECD, 2007:78). Also, since low-income groups tend to spend proportionally more of their income on gambling than higher-income groups, global lotteries may be regressive.

3.5.3. GLOBAL PREMIUM BONDS

A global premium savings bond, based on similar schemes operating in Bangladesh, Ireland and the United Kingdom, has been suggested as a new source of development finance. *"A premium bond is like a lottery ticket in that the return depends on a random prize draw, but otherwise it is a bond, hence a savings instrument where the capital is not at risk"* (OECD, 2007:78). Savings bonds in the United Kingdom each has a unique number which is entered in a monthly prize draw. Investors never lose their initial investment, although the return on that investment depends on luck. Annual premium bond sales presently run at £35 billion in the United Kingdom (National Savings and Investment, 2009:33).

3.5.4. INTERNATIONAL FINANCE FACILITY

The International Finance Facility (IFF), a temporary funding mechanism proposed by the United Kingdom, intends to generate additional resources to close the funding gap for the Millennium Development Goals. It will be based on *"long-term donor commitments comprising a series of pledges (each lasting 15 years) for a flow of annual payments to the IFF. Annual commitments would start from the $15-16 billion of aggregate Monterrey and post-Monterrey additional sums pledged and would rise by 4% (in real terms) per year"* (OECD, 2007:81). Pledges would serve as security against which the IFF would issue bonds. *"For prudential reasons, therefore, the IFF will have to limit the degree to which the donor commitments may be levered; at each disbursement, the Facility will allocate to it a fixed proportion of the donor commitment, taking into account the prevailing cost of long-term debt for the IFF in the donor country's currency and the leverage limit"* (OECD, 2007:81). Funds will be quickly disbursed as grants rather than loans using existing aid delivery channels acting as agents of the IFF. Grants would be provided exclusively to low-income countries.

Despite being a concrete proposal offering the possibility of doubling existing ODA, there are some mortal weaknesses which make it difficult to realise. Its requirement for political coordination amongst donor countries may be unrealistic. The Facility is based on the assumption that donors will be committed to it over a period of 30 years. With *"growing pension and social security burdens in ageing OECD countries ... the opportunity cost of aid will rise in most donor countries; hence, a continuous commitment towards the IFF might be difficult to sustain"* (OECD, 2007:82).

3.5.5. SPECIAL DRAWING RIGHTS

Special Drawing Rights (SDRs) are *"a form of money that the International Monetary Fund's Board of Governors can create by crediting accounts of the Fund's member states at an exchange rate determined by a basket of major currencies. Countries that run current-account deficits can transfer their SDRs to surplus countries, and the latter must provide them with convertible currencies in exchange"* (OECD, 2007:82). The idea of issuing SDRs for development has been around since the 1970s, but has never been tried.

SDRs can be issued for *"investment in 'global public goods' such as health initiatives and humanitarian assistance. Today, with trillions of dollars sloshing around the world bailing out the financial sector and ailing industries, it is time to direct a portion of this money to create 'green gold' to help finance a global war on climate change"* (Smith, 2009:unnumbered).

Recent proposals focus on developed countries creating new SDRs which would be deposited into trust funds. Trustees would identify a portfolio of projects with global or regional benefits from which donors would select those they wish to support. Donor countries would charge their public budgets to convert the SDRs to hard currency. This would require a change in the Articles of Agreement of the IMF, requiring ratification by 100 member countries with 85% of the voting power. This has so far never happened.

3.5.6. PUBLIC GUARANTEES

Winpenny (2003:16) argued that ODA should not be used to replace or discourage private investments flows, but should rather enable and facilitate it. Grants in aid have the potential to 'crowd out' other forms of financing. To avoid this, public guarantees may be *"the better instrument to mobilise other flows and empower local players"* (Winpenny, 2003:18).

During 2003 the World Panel on Financing Water Infrastructure - through the Camdessus Report - emphasised the importance of public guarantees to stimulate private investment in infrastructure. Investments in infrastructure are characterised by *"high capital intensity, long gestation periods and, where they are ODA financed, front-loading. The inherent sovereign risks are not covered by commercial banks, at least not for long maturities in the poorest countries"* (OECD, 2007:83).

Public guarantees could stimulate risk taking in high-risk environments, in which case steps must be taken to prevent excessive risk taking. Public guarantees may leverage the use of savings in projects with potentially high social returns and foster a sense of ownership in the recipient communities and countries. Care must be taken to avoid political interference by rent seeking elites, *"unsustainable debt burdens and misallocated resources"* (OECD, 2007:85).

3.5.7. PAYMENT FOR ENVIRONMENTAL SERVICES

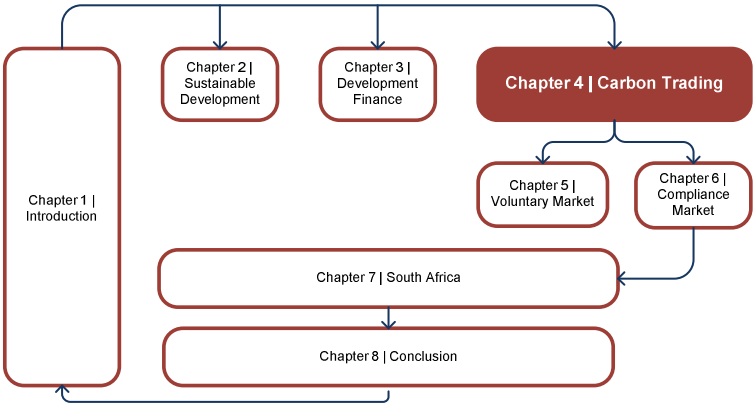
The creation of markets in current non-market goods and services, generate a flow of finance that mimics the financial flows for market goods. Since these goods and services will have significant public good characteristics, those paying for it will probably be governments or organisations with altruistic goals. An example of this is 'debt-for-nature' swaps (DfNSs) initiated in the late 1980s. Normally an investor purchases secondary international debt denominated in hard currencies and then offer to cancel or convert it in exchange for a desired outcome. Even though swaps are mainly linked to environmental products or services, some involve health, education or other social initiatives. Despite the loss of sovereignty of resources, swaps are attractive to indebted countries since it reduces foreign exchange commitments. They are also appealing to investors since it typically involves modest costs for potentially large scale benefits. At the same time it provides donor governments – under pressure to forgive debts – with the opportunity to cancel debts with generally benevolent consequences.

Swaps are limited to commercial and official bilateral debt and exclude multilateral debt. Bilateral debt deals tend to operate through the Paris Club; a group of bilateral lenders dedicated to reducing and converting debt that threatens poor country development. The Paris Club agreed to allow *"a considerable portion of international debt to be dealt with via debt-for-development swaps. In the event, only a limited number of creditor countries have operated such schemes"* (Pearce, 2007:458).

3.6. CONCLUSION

It is clear from this discussion that the current sources of development finance are inadequate when compared with the massive amounts needed for sustainable development interventions in both rich and poor countries. Realising this, world leaders have floated some interesting proposals focussing on securing new sources of finance. Some of these could make a significant contribution.

The main obstacle seems to be political will to make it work. Unprecedented levels of public debt as a result of the 2007 - 2009 credit crises, combined with the demographic transition in rich countries with aging and shrinking populations, may lead to most donor countries reducing development finance flows to poor countries. Market mechanisms, already favoured by donor countries, may prove to be a solution. Experience gained from carbon markets over the last decade may point the way. Chapter 4 will review this closer



4.1. INTRODUCTION

Carbon finance, a relatively recent development, is viewed by some as an innovative market-creating tool to achieve sustainability. It can be seen *"as a form of an output-based aid approach to mitigating climate change"* (Bishop & Johannes, 2006:1), intended to help project sponsors close the financing gap between emissions-efficient projects and conventional ones.

In theory markets for emissions reduction are a cost-effective means of creating an incentive to achieve two important things. On the one hand it creates a demand for new technologies, which is *"of the utmost importance for sustainability since it provides the means of improving human well-being without depleting natural resources at unacceptable rates"* (Pearce & Barbier, 2003:178-179). At the same time it is *"putting a price on pollution and thereby providing incentives for people to emit less"* (Bayon, Hawn & Hamilton, 2007:3).

Carbon markets are able to do this by channelling resources toward the most cost effective ways of reducing greenhouse gas emissions; monetarily punishing entities that emit more than their quota and rewarding those who emit less. This encourages entities to emit less, changing the economics of new emissions-efficient technologies, making them more competitive *vis-a-vis* emissions inefficient ones.

Since carbon is central to the functioning of the global economy, *"decarbonising the economy was not going to be easy. It was extremely unlikely that it would happen with the traditional regulatory policies"* (Pearce & Barbier, 2003:174). Carbon markets offer the possibility of achieving this.

4.2. HISTORY AND DEVELOPMENT

The intellectual origins of carbon trading can be found in the work of the Canadian economist John Dales. He built on the work of his contemporary Garret Hardin, who argued that *"natural resources in their unrestricted common property form would face tragic overexploitation by people acting in their rational self-interest"* (Hardin, 1968:1245). Dales proposed to control pollution by *"setting a total quota of allowable waste for each waterway and then set up a 'market' in equivalent 'pollution rights' to firms to discharge pollution rights up to this level"* (Dales, 1968:81). *"These rights, referred to as 'transferable property rights... for the disposal of wastes' would be sold to firms which could then trade them amongst themselves"* (Dales, 1968:85).

Dales' ideas resurfaced in the 1980s with the initiation of voluntary carbon offset projects in the United States. These voluntary markets originated in the desire of conservation organisations to find new ways of financing their projects (Hamilton *et al*, 2007:10). A basic argument was that *"in order to save the world's forests, society needed to value standing forests at least as highly as it values soy beans, cattle ranches, logging operations, and the other alternatives driving deforestation. As the saying goes, in the end we will protect what we value"* (Bayon *et al*, 2007:xviii). The first of its kind involved Applied Energy Services investing in a carbon sequestration project in Guatemala. Since there were no regulatory requirement for emissions offsets the motivation was *"primarily (promoting a) good corporate image and learning how the market would operate"* (Pearce, 2007:462).

Following these early pioneering projects, the United States Congress passed the *Clean Air Act* in 1990, creating a national emissions-trading scheme in sulphur dioxide (SO_2) (Bond, Dada & Erion, 2007:14). This highly successful trading scheme aims to reduce acid rain through capping SO_2 emissions by electric power plants. Those finding it too expensive to reduce their own emissions are permitted to purchase allowances from plants that make extraordinary cuts at lower cost. The

programme is very successful with emissions reducing faster than required at costs far below most forecasts. According to the Chicago Climate Exchange (CCX, 2008:unnumbered) registered traded values reached approximately $2 billion annually with an additional $2 billion a year in SO_2 allowance derivatives such as options, forwards and other unregistered trades.

Until 1997, the United States was the only country with any significant pollution trading scheme. This changed following the adoption of the Kyoto Protocol. Even though carbon trading was initially met with hostility from some European countries and environmental NGOs during the third Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC) in Kyoto, it was eventually adopted and appears in three separate articles of the final text of the Protocol.

4.3. THEORY OF CARBON MARKETS

"Greenhouse gasses are, in economic terms, an externality: those who produce greenhouse-gas emissions are bringing about climate change, thereby imposing costs on the world and on future generations, but they do not face the full consequences of their actions themselves" (Stern, 2006:xvii). The economic problem is *"untaxed and or unpriced emissions of greenhouse gasses. The externality requires a price for emissions: that is the first task of mitigation policy"* (Stern, 2006:35). Putting an appropriate price on carbon explicitly through tax or trading, or implicitly through regulation, means that polluters are faced with the full social cost[6] of their actions. Bearing the cost of pollution, polluters will have an incentive to switch away from high-carbon goods and services, and to invest in low-carbon alternatives.

Carbon trading is based on the work of Dales on transferable property rights for the disposal of wastes. The theory supporting what Perman (2003:224) called 'marketable permits', Tietenberg (2001:255) called 'transferrable emissions permits', and what Field and Field (2002:257) referred to as 'transferable discharge permits' is that *"a cost effective means of internalisation of externalities*

[6] Total damage of emitting greenhouse gasses

such as CO_2 emissions can be achieved through a market system of certificates trading" (Silayan, 2005:3). Pollution rights represented by 'certificates', can be bought and sold at market prices amongst market participants who are also polluters themselves. Market forces will ensure that cost efficient emissions reductions will be achieved.

Permits or certificates representing pollution rights may be viewed as a newly created property right giving holders or owners the permission to discharge specified pollutants (Field & Field, 2002:257). Thus, in the same way as no one may build a structure on a piece of land without the necessary permission, permits or land titles, no one may emit pollution without discharge certificates.

In addition, polluters who discharge more than their allowed amount will have to pay a fine for the additional emissions. The total amount of emissions allowed should be less than the total emissions emitted in a market, thus creating a shortage, which forces efficiency in the market. The shortage of allowances compels the market to create efficient ways and means to reduce emissions and comply with the amount allowed.

It may be possible for a country to reduce its emissions using a Command-Control approach with regulation, direct and indirect taxes. Emission taxes are a price instrument - it fixes the price while the emission level is allowed to vary according to economic activity. A major drawback of emission taxes is that the environmental outcome (i.e. the amount of emissions) is not guaranteed. A price instrument may cost the economy more to reduce the same amount of pollution compared to using emissions trading - a quantity instrument.

"Economic efficiency points to the advantages of a common global carbon price: emissions reductions will then take place wherever they are the cheapest" (Stern, 2006:xvii). The cost difference is the result of the different marginal abatement costs (MAC) for taking action in different countries. The marginal abatement cost refers to the costs incurred in reducing a unit of greenhouse gas emissions. Taking advantage of the difference in the MAC between different countries and installations is the principle behind the international emissions trading markets.

The overall goal of an emissions trading plan is to reduce emission, by directing resources towards the most cost effective means of reducing greenhouse gas emissions, while punishing those emitting

more than an established quota and rewarding those emitting less. Because it uses markets to determine how to deal with the problem of pollution, it is often touted as an example of effective free market environmentalism.

The textbook emissions trading programme can be called a 'cap and trade' approach in which an aggregate cap on all sources is established and these sources are then allowed to trade amongst themselves to determine which sources actually emit the total pollution load. While the cap is usually set by a political process, individual companies are free to choose how or if they will reduce their emissions. In theory, firms will choose the least-cost way to comply with the pollution regulation, creating incentives that reduce the cost of achieving a pollution reduction goal.

An emissions cap and permit trading system is a quantity instrument; it fixes the overall emission level (quantity) and allows the price to vary. An alternative quantity approach is a baseline and credit programme, in which polluters not under an aggregate cap can create credits by reducing their emissions below a baseline level of emissions as applied in the Clean Development Mechanism, where each project must declare a 'baseline' used for future crediting of emissions reductions. The baseline is calculated at business-as-usual. Any savings on emissions below the baseline for a specified period, receives credits for the reduced emissions. These credits can be purchased by polluters that are under a regulatory limit.

One problem with quantity instruments is the uncertainty of the cost of compliance as the price of a permit is not known in advance and will vary over time according to market conditions. This price instability and unpredictability can be resolved, to some degree, by the creation of forward markets[7] in caps.

Nevertheless, it is easier to make a tax predictable than the price of a cap. The problem of passing quota rents to businesses is a political one which may be avoided by auctioning permits instead of giving them away. Governments often are compelled to give permits away in order to make these schemes politically acceptable.

[7] A forward market is an over-the-counter financial market in contracts for future delivery.

As a result of the high uncertainty in the compliance costs of firms under a quantity instrument, some argue that the optimum choice is the price mechanism. However, scientists warn of a threshold in atmospheric concentrations of carbon dioxide beyond which a run-away warming effect could take place, with a large possibility of causing irreversible damages. As a result, a quantity instrument is the better option; the quantity of emissions may be capped with a higher degree of certainty.

A third option is to combine the price and quantity instruments, creating a system which is essentially an emission cap and trade system, but where the price of permits is only allowed within a prescribed band. Polluters may purchase emissions permits either in the marketplace, or from the government at a specific trigger price, which can be adjusted over time. The system is sometimes recommended as a way of overcoming the fundamental disadvantages of the price and quantity systems by *"giving governments the flexibility to adjust the system as new information comes to light. It can be shown that by setting the trigger price high enough, or the number of permits low enough, the safety valve can be used to mimic either a pure quantity or pure price mechanism"* (Pizer, 2002:411).

All three of these instruments are currently in use as policy instruments in controlling greenhouse gas emissions. The European Union's Emissions Trading Scheme (EU-ETS) is a good example of a quantity system. The United Kingdom's Climate Change Levy is a price instrument employing a direct carbon tax. China uses the carbon market to fund its Clean Development Mechanism (CDM) projects, but imposes a safety valve of a minimum price per tonne of CO_2e.

4.4. WHAT IS CARBON TRADING?

Carbon trading refers to the process of *"buying and selling of emissions permits that have been either distributed by a regulatory body or generated by greenhouse gas emission reduction projects"* (Bayon *et al*, 2007:4). Thus an *"entity buys an emissions credit or allowance for a given amount of (carbon dioxide equivalent) CO_2e from another entity in order to meet its target quantity of emissions. This target may be set voluntarily or through a regulatory regime"* (Taiyab, 2006:4). In addition to carbon dioxide (CO_2), five gasses contributing to the greenhouse effect (listed in table 3) are recognised under the Kyoto Protocol and generally traded. This is based on a schedule developed by the

Intergovernmental Panel on Climate Change (IPCC) determining *"the global warming potential (GWP) of each gas in terms of its equivalent in tons of CO_2 over the course of 100 years"* (Bayon *et al*, 2007:4).

Table 4.1 | Greenhouse Gasses

Gas		Global Warming Potential (GWP)
Carbon Dioxide	CO_2	1
Methane	CH_4	23
Nitrous Oxide	N_{20}	296
Hydrofluorocarbons	HFCs	1,300
Perfluorocarbons	PFCs	5,600
Sulphur Hexafluoride	SF	22,200

Source | Adapted from Bayon *et al*, 2007:4-5

Greenhouse gas emissions reductions are traded in carbon credits. Each carbon credit represents the reduction of GHGs equal to one metric ton of carbon dioxide (tCO_2e), the most common greenhouse gas. Payment can range from cash, equity and debt to the sharing of technologies to abate greenhouse gas emissions.

Carbon markets enable the trading of greenhouse gas emissions *"across temporal as well as geographic boundaries"* (Bayon *et al*, 2007:4). It also allows third-party players to get involved by taking on market risks in exchange for possible paybacks. Greenhouse gas emissions reductions credits may be accrued through two different types of transactions – allowance-based transactions and project-based transactions.

4.4.1. ALLOWANCE-BASED TRANSACTIONS

Allowance-based transactions involve *"the trading of issued allowances created and allocated by regulators under a cap-and-trade regime"* (Bayon *et al*, 2007:5). The regulatory authority *"caps the quantity of CO_2e that each participant is permitted to emit and issues tradable allowance units equivalent to the size of the individual caps"* (Taiyab, 2005:4).

Participants must reduce their emissions internally to comply with the cap. Those who can successfully reduce their emissions beyond the required levels are allowed to trade with other participants any unused allowances at a price acceptable to the market. *"Participants are free to buy and sell their allowances such that at the end of the compliance period, each participant holds a quantity of allowances equivalent to their actual emissions. This trading activity creates a 'carbon market'"* (Taiyab, 2006:5).

4.4.2. PROJECT-BASED TRANSACTIONS

Carbon credits can be created through carbon offset projects, which cancel out greenhouse gas emissions by either avoiding emissions or by sequestering existing greenhouse gasses (Taiyab, 2005:5). Project-based transactions allow buyers to acquire credits from projects demonstrating greenhouse gas emissions reductions (Capoor & Ambrosi, 2007:8). On issuing, project-based credits are essentially the same as allowances and can be traded on the carbon market in the same way as allowances. The main difference is that *"project-based credits are compliance assets that need to be 'created' through a process that has certain risks inherent with it (regulation, project development and performance, for instance) and can involve significantly higher transaction costs"* (Capoor & Ambrosi, 2007:8).

The emissions-efficiency of a project is measured by calculating a clear and credible baseline of projected greenhouse gas emissions in the absence of the project. The difference between the baseline emissions (B_e) and the carbon emissions (C_e) with the offset project, equal the volume of carbon credits (TV) available for trading ($B_e - C_e = TV$). Offset projects undergo a verification

process, proving the realisation of claimed emissions reductions, normally by an accredited independent third party.

4.5. ADDITIONALITY

The defining characteristic of carbon offsets is the additionality rule. Additionality requires that *"the emissions reductions must be additional to those that would have otherwise occurred under a business-as-usual scenario"* (Taiyab, 2006:3). It is *"the most fundamental – and contentious – issue in the carbon offset market. In theory, additionality answers a very simple question: Would the activity have occurred, holding all else constant, if the activity were not implemented as an offset project? Or more simply: Would the project have happened anyway? If the answer to that question is yes, the project is not additional"* (Kollmuss, 2008:15). If an offset project is not 'additional', payment for any credits generated in effect becomes a subsidy for an activity that would have happened anyway. It is therefore critical to the environmental integrity of project-based schemes, *"...as loose additionality requirements could result in a host of projects receiving carbon financing without actually reducing greenhouse gas emissions into the atmosphere"* (Taiyab, 2006:4).

Additionality is very difficult to determine in practice. Project based additionality testing evaluates individual projects on a case by case basis. A number of ways have been developed to demonstrate additionality. These include a:

- Legal and regulatory test. A basic test of additionality is to determine whether the project is implemented to fulfil official policies, regulations, or industry standards. *"If the project goes beyond compliance ('regulatory surplus'), it may be additional"* (Kollmuss, 2008:15).
- Investment test. The most common test of additionality is investigating the economic viability of the project without carbon finance. Therefore *"the revenue from the carbon offsets must be a decisive reason for implementing a project"* (Kollmuss, 2008:15).

- Barriers test. This test considers implementation and institutional barriers such as lack of capacity. *"If a project is successful in surmounting significant non-financial barriers that the business-as-usual alternative would not have had to face, the project is considered additional"* (Kollmuss, 2008:15).
- Common practice test. Where a project employs commonly used technologies, it may not be considered additional, since carbon offset benefits may not be a decisive issue in project viability.

The main problem with additionality testing is the subjective nature thereof. A project developer may claim that a project's internal rate of return is too low without a carbon revenue stream, making the project unviable. Since the project developer determines the level of an acceptable internal rate of return it is easy to question the validity of the additionality demonstration. The only way to test the additionality claims will be through unhindered *"access to internal company information relating to the financing of the project, yet this information is in most cases confidential"* (Kollmuss, 2008:16).

4.6. CARBON MARKETS

Carbon markets can be segmented in a number of different ways; the most common is to differentiate between compliance and voluntary markets. Compliance markets are *"large, well-funded, and followed by dozens of media outlets, hundreds of traders, and countless businesses"* (Hamilton *et al*, 2007:10). Most compliance markets are somehow underpinned by the Kyoto Protocol. Voluntary markets, even though a lot older are much smaller and much more flexible.

There is also a growing retail carbon segment that sells emission reductions to individuals and companies seeking to offset their own carbon footprints. *"Reports of increased interest of banks, credit cards issuers, private equity funds and others in this segment suggest that it could grow exponentially if only there were a credible, voluntary standard for such assets"* (Capoor & Ambrosi, 2007:9).

4.7. CRITIQUE

It is widely recognised that the Kyoto Protocol was a first attempt to deal rationally with an extremely complex problem. It would therefore be strange if it did not encounter difficulties. Yet the regime has been criticised harshly.

"However, attitudes to the use of market mechanisms in general are mixed, and these debates apply not just to the compliance market but to the voluntary sector as well. Some far-sighted concerns revolve around the carbon market support of the wider project of neo-liberalism, with its devotion to market forces, the self-regulating market and the requisite commoditisation of nature" (Harris, 2007:26). These critics argue that rather than solving anything, assigning property rights using market mechanisms, actually provides participants with a right to pollute, contributing to increased corporate power. This permits the rich to *"buy their way out of their obligations, sanctioning their wasteful lifestyles"* (Harris, 2007:26).

Critique of carbon trading tends to focus on the following issues:

4.7.1. EMISSIONS TARGETS

"As every government strives to minimize the restraints upon the lives of its citizens, international climate negotiations have so far been detached from what the science is saying" (Monbiot, 2006:48). Reductions agreed under the Kyoto Protocol – averaging 5.2 % on 1990 levels by 2012 – bear no relationship to the reductions required to begin addressing the problem of climate disruption. *"Guy Brasseur, head of the Hamburg-based Max Planck Institute for Meteorology, told the European Parliament in November of 2005, 'Kyoto won't be enough. Emissions need to fall by 80% or 90%, rather than 5 or 10%'"* (Bayon *et al*, 2007:10).

"Stabilising at or below 550ppm CO_2e would require global emissions to peak in the next 10 – 20 years, and then fall at a rate of at least 1 – 3% per year. By 2050, global emissions would need to be around 25% below current levels. These cuts will have to be made in the context of a world economy

in 2050 that may be 3 – 4 times larger than today – so emissions per unit of GDP would need to be just one quarter of current levels by 2050" (Stern, 2006:xi).

Instead of agreeing on an international target for annual emissions to begin adequately addressing the problem, the current system perpetuates global inequity by linking a *"country's entitlement to pollute to the amount of pollution it already produces. The dirtier you are, the bigger your entitlement"* (Monbiot, 2006:48). This creates *"one of the largest and most regressive schemes for creating property rights in history"* (Bond *et al*, 2007:5). A far more equitable way of allocating pollution rights would be to award rights equally on a per capita basis globally, and then to allow trading between countries to enable those who are more emissions intensive to meet their obligations.

Although serious, these weaknesses cannot be blamed on carbon markets. The market does not set the level of a cap, policy-makers do. The market can only be a tool to accomplish the goal.

4.7.2. MARKET INTEGRITY

Market integrity depends on the clarity and simplicity of its rules, the transparency of information and on institutions that guard against fraud and manipulation. While the regulated markets to a certain extent attempt to address these concerns, the voluntary market is vulnerable to such criticism.

Questioning the integrity of markets, some critics accuse carbon markets of allowing companies to *"'greenwash' previously tarnished environmental reputations without changing their behaviour in important ways. Carbon offsets are based on fictitious carbon accounting, and can by themselves not make a company carbon neutral"* (Bayon *et al*, 2007:4). Nick Davies, in an article published in the British newspaper The Guardian (16 June 2007), described carbon offsets as *"an imaginary commodity created by deducting what you hope happens from what you guess would have happened."*

Land-use, land-use change and forestry (LULUCF) projects have drawn much of the attention from critics questioning the integrity of carbon offsets. Since fossilised carbon and biological carbon originate from different pools, claims of reducing the climate impact of *"the release of fossil carbon*

with increased storage of biological carbon is unsubstantiated. On this basis alone, tree planting offset claims are misleading and it should be unacceptable to treat credits from tree planting offset projects as equivalent to fossil carbon releases" (FERN, 2007:3).

Forestation projects provide considerable measurement and accounting challenges based on limited insight into terrestrial carbon cycling. *"As a result mathematical formulae used to calculate carbon values in tree planting offset projects make widespread use of default values which may or may not reflect the true nature and volume of carbon interactions triggered by a tree planting offset project. In fact, the gaps are so significant that accounting for the true fluxes of carbon in complex ecosystems like forests and over long periods of time is not possible today"* (FERN, 2007:3).

A steady stream of research confirms this. For example Schiermeier (2006:128) reported that *"the planet's plant-life was responsible for far greater methane emissions than had previously been anticipated."* Methane, being a potent greenhouse gas, contributes significantly to climate change. This contradicts calculations about the net climate benefit of biomass. It is not possible to reasonably claim to have swapped fossilised carbon for biological carbon.

Critique on the quality of offsets is particularly important to the voluntary market, being criticised for false claims about emissions reductions. Much of this is attributable to the lack of regulated standards negatively impacting credibility and producing inconsistent quality. The basic problem is that with more regulation costs rise, but the less *"you regulate, the greater the openings for chancers who claim that they are generating offsets from any old nonsensical scheme"* (Smith, 2008(a):unnumbered).

In addition the market is characterised by *"fragmentation and a lack of widely available impartial information. The fragmented and opaque nature of the voluntary market can, in large part, be attributed to the fact that it is partially composed of deals that are negotiated on a case-by-case basis, and that many of these deals neither require the carbon credits to undergo a uniform certification or verification process nor register them with any central body"* (Bayon *et al*, 2007:12). This situation leads some environmentalists to allege that the voluntary market is a *"game of smoke and mirrors rather than an engine of actual environmental progress"* (Bayon *et al*, 2007:12).

The lack of transparency in the voluntary offset market leaves the door wide open for fraudulent accounting practices and unsubstantiated claims. Consumers report to feel concerned about the fact that projects often carry the real risk of non-delivery. *"Most offset companies issue legal disclaimers absolving them legally from responsibility for their project partner's inability to implement projects in such a way that the carbon savings/extra carbon storage is ensured"* (FERN, 2007:5).

Stern argues that *"establishing credibility takes time. The next 10 to 20 years will be a period of transition, from a world where carbon-pricing schemes are in their infancy, to one where carbon pricing is universal and is automatically factored into decision making"* (2006:xix).

4.7.3. ADDITIONALITY

Many critics have focused on the question whether the Kyoto Protocol, and specifically the CDM regime, is providing actual climatic benefits. One of the thorniest problems with this is the additionality requirement. If the additionality rule is not met and a project that was going to happen anyway is used to justify emissions elsewhere, it can result in a net increase in atmospheric carbon.

In order to trade carbon credits, project developers must prove that in the absence of the project, more greenhouse gasses would be emitted into the atmosphere. Therefore, project developers calculate the volume of tradable credits as the difference between 'business-as-usual' emissions and the emissions in the presence of the offset project. This is done by theorizing on what would have happened without the offset project. *"Every carbon offset project does not only pretend to know the answer to this unanswerable question – they pretend to be able to give an exact figure. This figure will determine how many carbon credits the project can sell as saving over 'what would have happened otherwise' and evidence is plentiful of projects inflating this baseline figure in order to maximise the volume of credits the project will be entitled to sell"* (FERN, 2007:6). Even though mathematical formulas developed to determine this figure may limit the range of possible answers, it will remain an unverifiable estimate. Consequently no carbon offset project can actually verify the claimed reductions.

"Despite the regulatory procedure that is supposed stringently to guarantee that emissions reductions under the CDM are all additional, the market seems riddled with examples to the contrary. An adviser to the executive board of the CDM in 2006 conducted an investigation into CDM projects in India and concluded that one third of them were non-additional" (Smith, 2008(b):2).

Some argue that this conceptual defect of carbon offsets cannot be rectified by additional project oversight or by addressing what is often described as 'offset market design' shortcomings. *"There is no remedy to this underlying flaw and emission reduction claims by offset projects will always remain unverifiable"* (FERN, 2007:7). Bond (2007:1) refers to the abuse of the additionality rule a *"blatant scamming."*

4.7.4. TRANSACTION COSTS

"Complex and evolving regulations, regulatory inefficiencies, and capacity bottlenecks have caused delays that have negative financial impact on projects. It now takes an average of 572 days for a CDM project to go through validation and registration and another 607 days until first issuance" (Kossoy & Ambrosi, 2010:47). These delays and uncertainties lead to an escalation of transaction costs.

It can cost anywhere from $50,000 to $250,000 to get a carbon offset project approved and registered under the Kyoto Protocol. When the clean development mechanism (CDM) Executive Board registers *"a typical small-scale CDM project (essentially creating the CERs that can be sold on the CDM markets), the United Nations Development Programme calculates that the project's total up-front costs will account for 14-22% of the net present value of its revenue from carbon credits"* (Bayon *et al*, 2007:12). Many projects, especially small projects in poorer countries, find it incredibly difficult to come up with the start-up capital to register a project for the compliance carbon market.

Registering CDM projects involves a number of fixed costs including project idea note (PIN) and project design document (PDD) development, advisory services, validation, registration, verification

and issuance. To be profitable and attractive to investors a project requires sufficient scale as illustrated in figure 4.1.

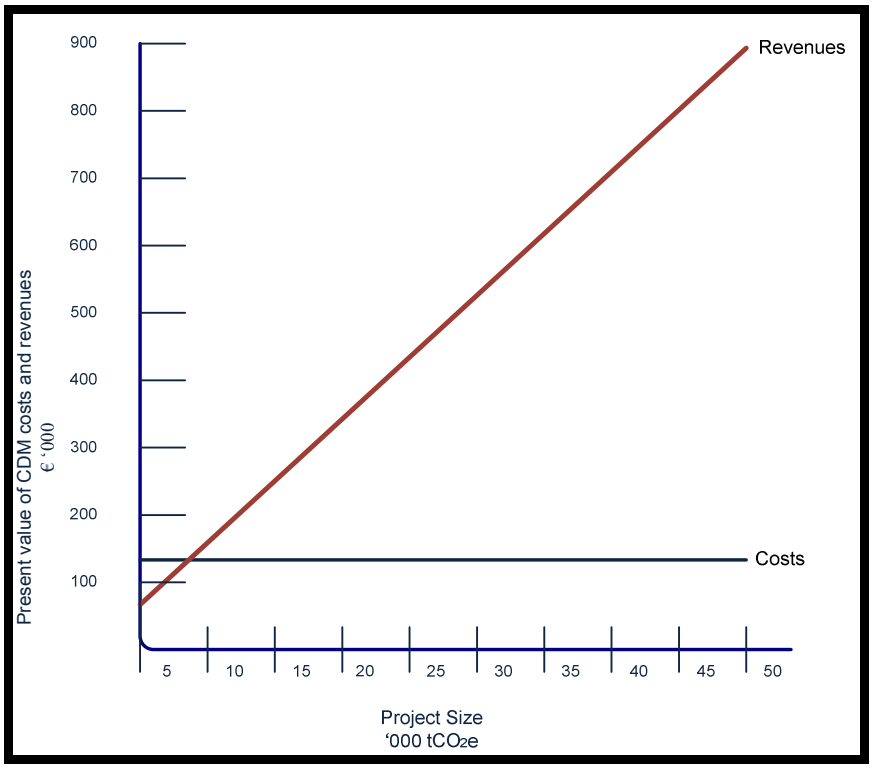


Figure 4.1 | Project revenues compared with size (Source: South Pole Carbon as cited in Murove, 2009:12)

One way to overcome the high fixed costs is for entities to register a group of similar CDM activities as a programmatic CDM (pCDM). This can take place in many different locations (including multiple countries) over a long period of time.

4.7.5. INSTITUTIONAL WEAKNESSES

Criticism about institutional weaknesses tends to focus on either too much or too little regulatory involvement. The United Nations admitted that there is *"'a clear and perceived risk of collusion'*

between the project developers and the private, third-party auditors, who are supposed to be verifying the quality of the credits" (Smith, 2008(b):2). If it would become apparent in the next decade that the CDM regime has failed because a majority of traded CERs were based on questionable methodologies or even outright fraud, *"the impact could be even more catastrophic than the recent financial instabilities caused by the credit crunch. And unlike the global credit crisis, no injection of capital will be able to turn the clock back on an ever-decreasing window of opportunity to meaningfully address the climate crisis"* (Smith, 2008(b):2).

The carbon market is only a tool to achieve the objectives regulators set for it. They will determine how effective the market will be in this process. The immaturity of the carbon market and hence the regulatory process, has certainly caused some problems. For example during April 2006, the European Union's Emissions Trading Scheme market crashed thanks to the over allocation of pollution rights to targeted installations. At the same time the carbon spot market price lost more than half its value in one day, *"destroying many CDM projects earlier considered viable investments"* (Bond *et al*, 2007:2).

4.7.6. SUSTAINABLE DEVELOPMENT

Most of the criticism against carbon trading and the clean development mechanism specifically, seem to focus on its apparent inability to deliver on the sustainable development objective the Protocol tasked it with. *"In practice, host governments need only rubber stamp their approval to this condition, and genuine developmental benefits on the ground have proven to be elusive to the point of non-existence"* (Smith, 2008(b):1). Smith mentions a report published in January 2007 indicating that close to 200 studies on the CDM have been carried out since its birth in 1997. The main finding is that, left to market forces, the CDM does not significantly contribute to sustainable development.

Not only do projects not contribute to sustainable development, they may sometimes cause other environmental and social problems. In some cases, the recipients of carbon money are big polluting industries responsible for adverse environmental impacts. It may also cause or exacerbate existing local conflicts. *"In order to generate carbon credits from trees or energy crops, plantation companies*

have to maintain and expand their hold on land that ordinary people may need for other purposes. In order to generate carbon credits from burning the methane released from landfill sites, authorities have an incentive to keep them open. In order to keep track of the carbon their agro-forestry schemes generate, rural development organisations have to divert resources from their traditional work. In order to get carbon credits for halting flaring, oil companies have to go on drilling and polluting" (FERN, 2007:5).

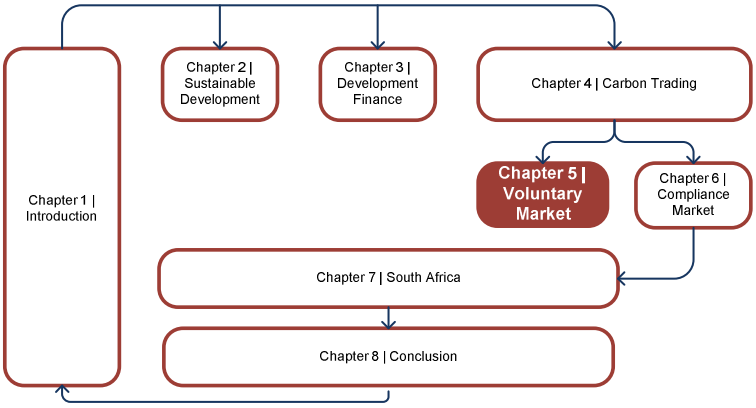
Although responsible to define sustainability criteria used in the process of approval of CDM projects, host countries are not *"responsible for the monitoring of sustainable development. This is a major gap in the CDM process. Even countries such as South Africa, with a very detailed and robust set of sustainability criteria, have not implemented the kind of monitoring procedures which might establish whether a project has met its CER requirements but failed to achieve the promised SD benefits"* (Pfeifer & Stiles, 2009:4).

4.8. CONCLUSION

Greenhouse gasses are an externality: those who produce greenhouse-gas emissions are bringing about climate change, thereby imposing costs on current and on future generations. Up to recently polluters did not face the full consequences of their actions themselves since their greenhouse gas emissions were untaxed and unpriced. The situation was directly responsible for the current climate disruption crisis.

The economic solution to the problem requires a price for emissions, since bearing the cost of pollution polluters will have an incentive to switch away from high-carbon goods and services, and to invest in low-carbon alternatives. There are two options to putting a price to emissions – employing a price mechanism (typically carbon taxes) or a quantity instrument (limiting allowable emissions). Because scientists warn of a threshold in atmospheric concentrations of carbon dioxide beyond which a run-away warming effect could take place, a quantity instrument is the better option; the quantity of emissions may be capped with a higher degree of certainty. The first and most important purpose of carbon trading is to reduce greenhouse gas emissions, which has a direct impact on the ability of

especially the poor to secure their livelihoods. Despite the criticism over, that is the most important contribution it can make to sustainable development.



5.1. INTRODUCTION

In this chapter voluntary carbon markets will be investigated. Project classes, the voluntary carbon market supply chain, the growth and development of the market, price trends and consumers of the voluntary carbon market are discussed.

5.2. BACKGROUND

As the name indicates, *"voluntary (carbon) markets are defined by a lack of regulatory drivers"* (Hamilton *et al*, 2007:12). They operate along with and are heavily influenced by compliance markets, with buyers purchasing carbon credits for purposes other than meeting regulatory targets, including voluntarily purchasing credits from a CDM project. *"The action is defined as voluntary as long as the credits will not be used to meet a regulatory target"* (Taiyab, 2006:8).

Like credits traded in a regulated scheme, voluntary offset projects generate credits – Verified Emissions Reductions (VERs) - equivalent to the removal or avoided emission of one metric tonne of

carbon dioxide. Since the voluntary market does not operate under a universal regulated cap, all VERS are project-based. The only exception is trading under the Chicago Climate Exchange. Buyers purchasing VERs either set caps on themselves, or decided to offset some or all of the emissions related to their activities. Credits purchased to offset greenhouse gas emissions must be retired.

Although voluntary markets are small compared to the compliance markets, Hamilton (2007:10) argues that *"their value and potential lies elsewhere. It cannot be measured merely in tonnes of CO_2e transacted. There is, for instance, a unique indicative component: because buyers engage in their own volition, participation can provide insights into public interest in climate change, as well as where the broader market may be headed."* An inherent advantage of these markets is their flexibility and the potential for innovation.

The voluntary carbon market is fragmented, incorporates a complex supply chain, and lack a set of consistent standards. As a result *"the market operates under the principle of* caveat emptor*: let the buyer beware... There are signs, however, that the market is beginning to consolidate around a few guiding practices and business models from which conclusions can be drawn about market direction and opportunities"* (Bayon *et al*, 2007:17).

5.3. PROJECT CLASSES

"Offset project type and location is an important differentiating factor for credits in the voluntary market since suppliers are facing increasing pressure to be transparent about offset sources and it is widely assumed that the story behind an offset may influence customer choice" (Hamilton *et al*, 2007:25). Table 5.1 reflects project classes generating VERs commonly traded on voluntary markets (see also Addendum 2 for more detail).

Table 5.1 | Recorded 'Over the Counter' Transactions

$ktCO_2e$	Asia	Africa	North America	South America	Europe and Russia	Australia/ Other	Total	%
Forestry	19	328	2,343	659	128	28	3,505	36%
Afforestation/ reforestation Plantation	18	4	6	193	0	0	221	2%
Afforestation/ reforestation mixed native	1	308	2,337	157	128	26	2,957	31%
Avoided deforestation	0	16	0	309	0	2	327	3%
Methane	28	0	184	1	39	0	253	3%
Livestock	28	0	42	1	39	0	110	1%
Landfill	0	0	39	0	0	0	39	0%
Coal	0	0	103	0	0	0	103	1%
Renewable	1823	188	296	456	300	111	3173	33%
Off-grid renewable energy	823	148	0	205	300	11	1487	15%
Renewable energy credits (RECs)	1000	40	296	251	0	100	1686	17%
Energy Efficiency	251	40	28	7	106	87	518	5%
Industrial Gas	0	0	1183	800	0	0	1983	20%

Mixed/Other	27	0	141	0	16	60	244	3%
Total	**2147**	**556**	**4175**	**1923**	**589**	**286**	**9676**	
Percentage	22%	6%	43%	20%	6%	3%	100%	

Source | Hamilton *et al*, 2007:25

5.3.1. LAND-USE, LAND-USE CHANGE AND FORESTRY

From Table 5.1 it is clear that land-use, land-use change and forestry (LULUCF) projects dominate the voluntary market. *"This predominance of forestry credits in voluntary carbon markets is not surprising... Compared to Kyoto markets, it's clear that the voluntary carbon markets play a critical role in financing sequestration projects... Moreover, the EU ETS, the largest potential market for carbon offsets currently does not accept LULUCF credits of any kind"* (Hamilton *et al*, 2007:29).

LULUCF projects are often valued more highly for the co-benefits it provides. It may include benefits for hosting communities and local biodiversity, as well as other values consumers in this market care about. Not all forestry projects include sustainable development co-benefits; several have had negative social and/or environmental impacts.

5.3.2. INDUSTRIAL GASSES

Mimicking the CDM market, a significant part of the voluntary markets concentrated on the destruction of industrial gasses with high global warming potential. *"...trends appear to indicate that their use in the voluntary markets may decrease. This could be due to issues such as the treatment of new HFC facilities under the CDM, lack of sustainable development co-benefits and/or because of a theoretically limited supply of these types of credits"* (Hamilton *et al*, 2007:28).

5.3.3. RENEWABLE ENERGY PROJECTS

Renewable Energy Credits (RECs) and other renewable energy projects accounted for about a third of the voluntary carbon market (Hamilton *et al*, 2007:29) and will probably grow in importance. Market share increased to 51% in 2008 (Hamilton *et al*, 2009:iii).

5.4. SUPPLY CHAIN

Even though it is difficult to accurately illustrate the supply chain linearly, it is still useful to produce a simplified model to understand how carbon credits generally get to market. Figure 5.1 shows a simplified model of the voluntary carbon market supply chain.

Normally *"...a project or project idea is generated, the resulting emission reductions are verified to some standard to create carbon credits, the credits are sold to middlemen, and the middlemen sell them on to businesses and individuals"* (Bayon *et al*, 2007:18). Brokers and exchanges may facilitate transactions but do not usually buy or sell credits themselves. Some project developers may decide to omit stage two and/or three, selling credits - either verified or unverified - directly to buyers.

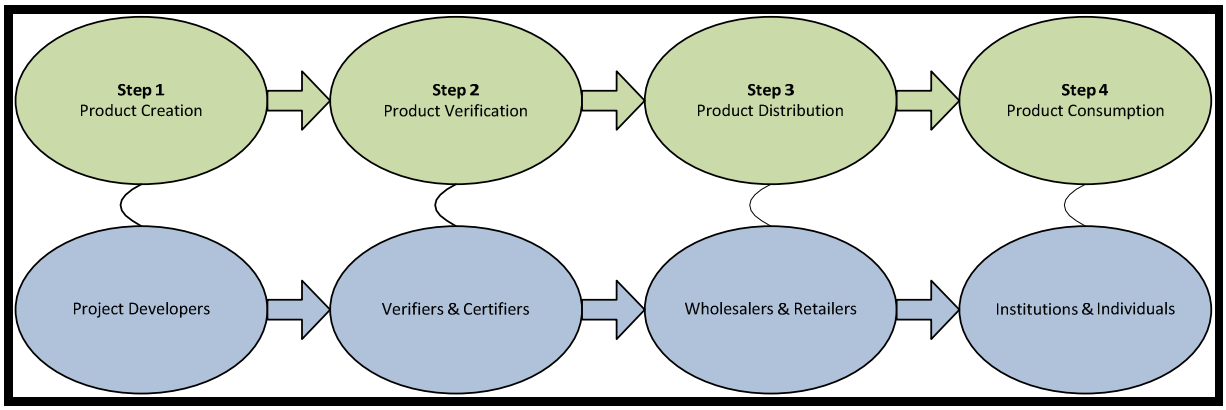


Figure 5.1 | Simplified Supply Chain of the Retail Carbon Market (Source: Adapted from Bayon *et al*, 2007:18)

5.4.1. VERIFICATION

Verification is the key to creating a marketable product – verified emissions reductions (VERs), used as a *de facto* currency in the voluntary carbon market. It embodies the ideal of legitimate third party verification.

Various accounting methodologies are utilised in establishing credits in the voluntary carbon market (see Addendum 3 for more detail). Regardless of the preferred methodology, according to Hamilton (2006:20 - 21) a few key considerations guide offset quality. These are:

- Additionality;
- Permanence - the ability to guarantee greenhouse gas mitigation over an agreed period of time;
- Leakage - avoiding transferring emissions to another site;
- Double counting – avoiding double counting emissions reductions by for example retiring credits once only;
- *Ex-ante* and *ex-post* accounting - *ex-ante* accounting (traded before production) involves higher risk, commands lower prices and requires rigorous guarantees; and
- Co-benefits - additional benefits, besides the mitigation of greenhouse gasses, like contributions to local economic development.

For reasons of credibility, buyers prefer independent third party verification to in-house verification. In an attempt to mitigate high transaction costs and confusion resulting from the variety of projects in this market, several organisations have developed standards or certification programmes (see Addendum 4 for more detail), which can potentially be extremely valuable in ensuring a consistent level of quality. It could also reduce transaction costs for consumers and build customer trust.

5.4.2. DISTRIBUTION

Distribution of VERs is normally done by middlemen - retailers, brokers and exchanges (as illustrated in figure 5.2).

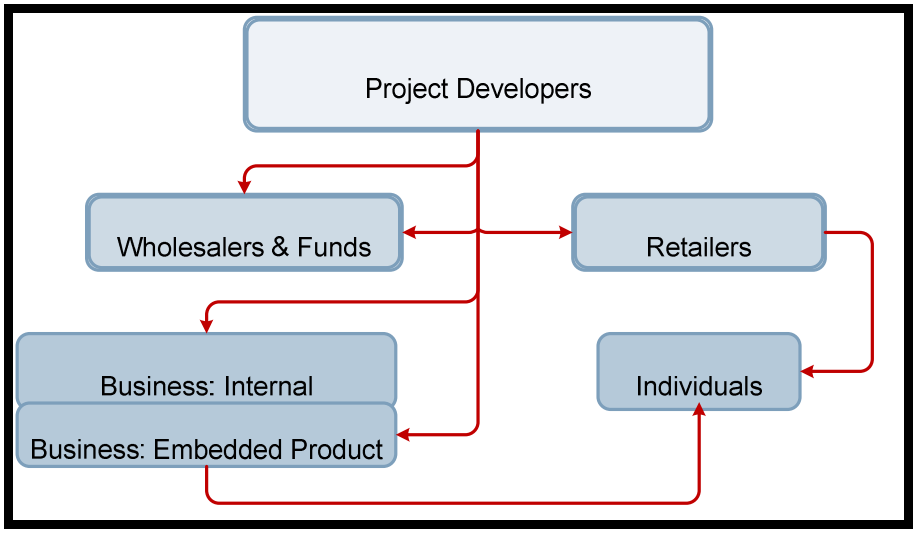


Figure 5.2 | Common types of transactions in the voluntary carbon market (Source: Adapted from Bayon *et al*, 2006:29)

5.4.2.1. RETAILERS

It is estimated that there are 30 to 40 carbon retailers globally (Taiyab, 2006:14). As in other industries, the quality of product traded by retailers varies. *"Aside from varying levels of quality, another problem with the retail market is the size of the mark-up added on to the VERs and the percentage of revenue that is spent on marketing and administrative costs rather than the project itself"* (Taiyab, 2006:14). In order to keep costs down, some retailers operate as non-profit organisations.

5.4.2.2. BROKERS

Brokers facilitate transactions between parties, most often in CERs purchased under the CDM, but also in VERs. They generally charge a fee-for-service of around 7.5% (Taiyab, 2006:9).

5.4.2.3. EXCHANGES AND REGISTRIES

The Chicago Climate Exchange is the primary example of a trading platform for voluntary carbon credits. Access is restricted to members who voluntarily committed themselves to a legally binding emissions reduction schedule.

5.4.3. CONSUMPTION

Consumers either do once-off purchases, or may choose to enter into an ongoing relationship with a middleman, buying VERs from a project or a portfolio of projects annually. They purchase credits to offset one of several types of emissions:

- Internal emissions generated by their facilities and staff in the course of doing business.
- Product life cycle emissions generated by the use of a company's products. These products may carry a price-premium being marketed as carbon neutral.
- Individual emissions involving individual consumers purchasing carbon credits to offset their activities.

5.5. GROWTH AND DEVELOPMENT

Despite the fact that voluntary markets have been operating much longer than compliance markets, they remain small and fragmented, *"representing only about 2.2% volume-wise of the size of the regulated markets"* (Hamilton *et al*, 2008:25). Although the fragmented nature of the voluntary market complicates an accurate estimation of its size, indicators seem to confirm that it has been growing rapidly over the last few years. Taiyab (2006:20-21) contributes this to the increasing role of

corporate social responsibility responding to the rise in environmental reporting which raised awareness.

"Some investors think that, as regulation comes online in the US and more sectors are included in the EU ETS, voluntary carbon credits will see a jump in value not unlike that experienced by CDM credits once the Kyoto Protocol went into effect" (Bayon *et al*., 2007:35).

Table 5.2 | Voluntary Carbon Market Size

Year	Estimated/projected market volume (million tons/year)
2004	3 – 5 Mt
2005	10 – 20 Mt
2006	20 – 50 Mt
2007	100 Mt
2008	123.4 Mt

Source | Adapted from Bayon *et al*, 2007:14

During 2008, the Chicago Climate Exchange (CCX) overtook the over the counter (OTC) market in traded volumes for the first time. According to Hamilton (2009:i) the CCX traded 69.2 $MtCO_2e$ or 56% of total volumes, while the OTC market traded 54 $MtCO_2e$ or 44% of total volumes. The total market was valued at $705 million during 2008, more than twice their 2007 value of $335 million.

5.6. PRICE TRENDS

The nature of the voluntary market complicates tracking trends in the wholesale price of carbon credits. Unit prices range between $2 and $16 (Barry, 2007:9). *"Prices can be compared at two*

levels: the cost of the offset project and the market price of the credit sold. Project cost is influenced by three major factors: technical reduction costs (influenced by factors such project type, size, location, upfront costs vs. length of return, profits from co-benefits and additionality), transaction/administration costs, and seller's profit" (Butzengeiger, 2005:11). Market price is determined amongst others by the stages followed from project conceptualisation to consumption. Brokers, retail sellers, verification, certification and marketing may increase the price. Other factors influencing price are:

5.6.1. PROJECT SIZE

Similar to other commodities, and following the principles of the economies of scale, the size of a purchase influences the price. Thus the unit price is lower for larger volumes. Hamilton (2007:36) found that *"micro-scale projects of less than 5,000 ton have a volume weighted price of around $5/t, whereas very large projects show a volume weighted price of around $2/t"* (Hamilton *et al*, 2007:36).

5.6.2. PROJECT TYPE

As can be seen from Table 5.3, the unit price is heavily influenced by project type.

Table 5.3 | VER Prices by Project Type

Project Type	Price Range ($/tCO$_2$e)
Afforestation/reforestation monoculture	10 – 13
Afforestation/ reforestation mixed native	0.5 – 45
Avoided deforestation	10 – 18
Methane - Livestock	6
Methane - Landfill	0.75 – 26

Methane – Coal Mines	20
Industrial Gas	4
Direct Fossil Fuel Reduction	0.5 – 20
Off-Grid Renewable	5 – 18
Renewable Energy Certificates	0.75 – 20
Mixed	7 - 10

Source | Hamilton *et al*, 2007:34

5.6.3. PROJECT AND CUSTOMER LOCATION

Credits originating from the European Union traditionally fetches higher prices than credits from other regions, while *"credits from New Zealand, South Africa, Malaysia and Australia fetched a premium over other countries, earning $19.20, $15.40, $14.40, and $13.30 per tCO_2e respectively"* (Hamilton *et al*, 2009:v).

"When purchasing from a retailer, it seems, and without taking exchange rates into account, there is relatively little difference between the prices by location of the buyer, although EU buyers do tend to pay slightly more than buyers in the US or Australia" (Hamilton *et al*, 2007:34 - 35).

5.6.4. OTHER FACTORS

Credits assessed according to more stringent standards fetch higher prices, as well as credits which are better marketed.

5.7. CONSUMERS

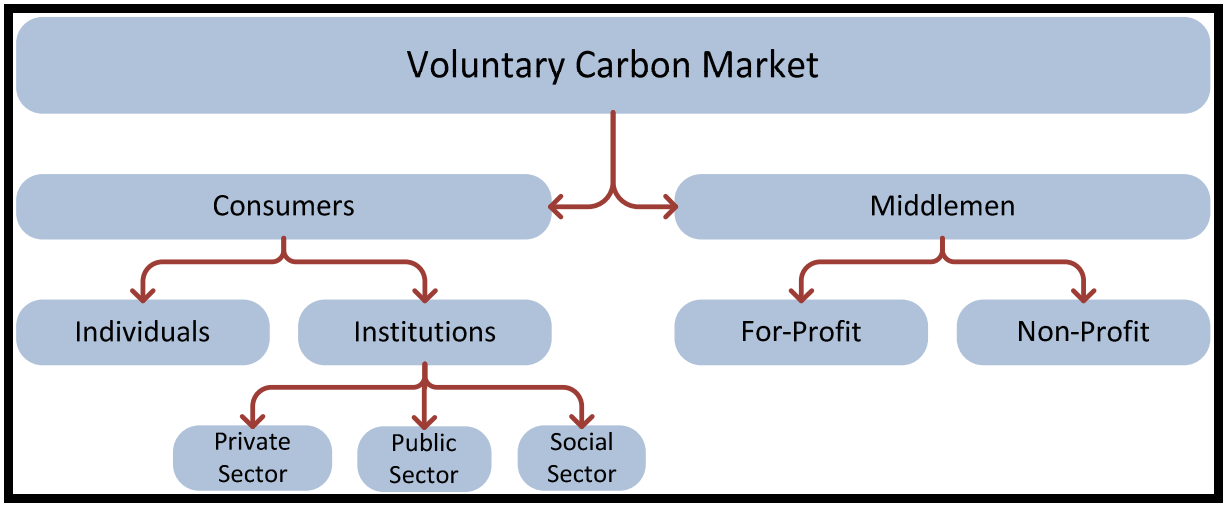


Figure 5.3 | Consumers in the Voluntary Carbon Market (Source: Adapted from Bayon *et al*, 2007:31)

Buyers of voluntary carbon credits generally fall into five categories - business, non-governmental organisations, government agencies, event organisers and individuals (Taiyab, 2006:15). Business is by far the biggest consumer category in this market.

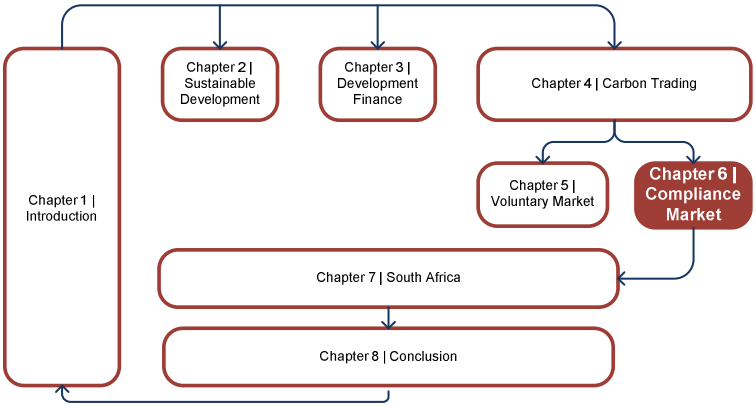
The most important consideration for buyers is credibility and integrity of credits. In the absence of a central verification and registration body enforcing standards, it is difficult to determine the quality of offsets offered. In addition buyers are concerned about the sustainable development benefits of projects, the availability of information about projects and the price of VERs.

5.8. CONCLUSION

Voluntary carbon markets, defined by a lack of regulatory drivers, created the current market for carbon emissions. Operating alongside compliance markets, buyers purchase carbon credits through this market for purposes other than meeting regulatory targets. Although voluntary markets are small

compared to the compliance markets, their value and potential probably lies not such much in their ability to reduce large amounts of greenhouse gas emissions. An inherent advantage of these markets is their flexibility and the potential for innovation. Their flexibility and relatively low transaction costs holds the potential to be of more direct benefit to the poor.

A major problem with this market is that it is highly fragmented with no clear set of consistent standards. As a result the market's integrity is vulnerable to criticism. As a result of the market fragmentation and the consequent difficulty in accessing information, the remainder of this study will focus on compliance markets and specifically the clean development mechanism.



6.1. INTRODUCTION

In this chapter compliance carbon markets will be investigated. The Kyoto Protocol and its three flexibility mechanisms – emissions trading, joint implementation and the clean development mechanism – is reviewed. The clean development mechanism is then discussed in more depth by looking at its institutional arrangements, the CDM project cycle, asset classes, standards, its growth and development, price trends, project distribution, and its contribution to sustainable development.

6.2. BACKGROUND

In response to the United Nations Framework Convention on Climate Change (UNFCCC), an international environmental treaty, a number of compliance carbon markets have emerged around the world, of which the European Emissions Trading Scheme (EU ETS) is by far the largest. The UNFCCC resulted from the 1992 United Nations Conference on Environment and Development – the so-called Earth Summit - in Rio de Janeiro. Even though the UN Convention intended to stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous climate disruption, it made no provision for mandatory limits on greenhouse gas emissions for individual

countries. It did require Parties to negotiate and adopt protocols setting mandatory emission limits. The Kyoto Protocol, adopted at the third Conference of the Parties (COP), resulted from this process. Ratified by 184 countries, the Protocol is a legally binding treaty.

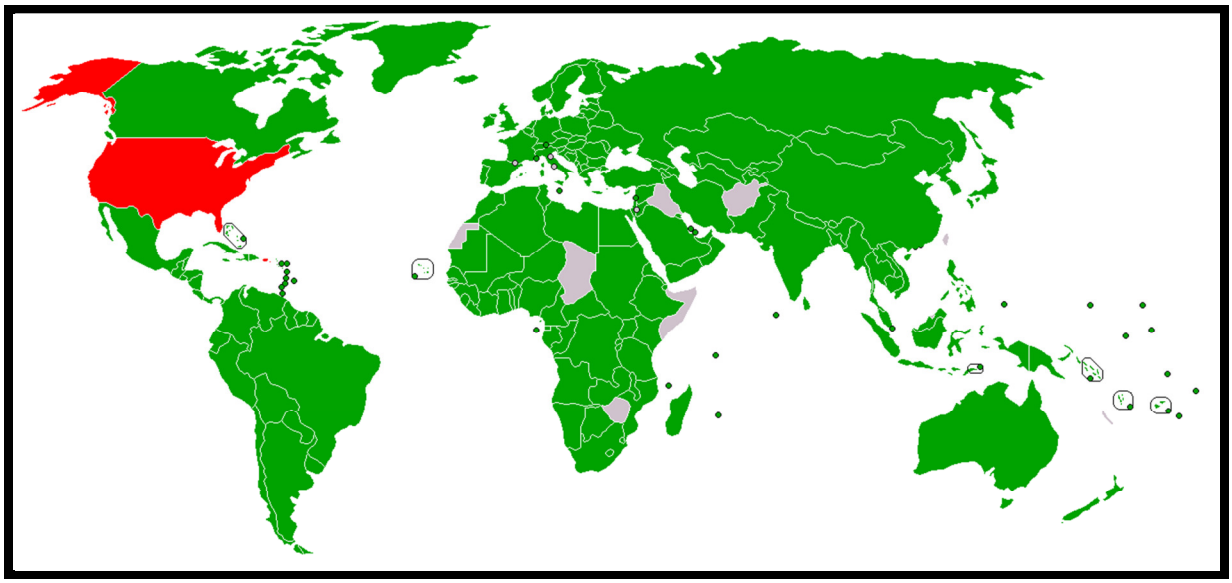


Figure 6.1 | Parties to the Kyoto Protocol (Source: UNFCCC, 2009(a):unnumbered). (Green | ratified) (Grey | not decided on ratification) (Red | do not intend ratifying)

6.3. THE KYOTO PROTOCOL

In response to the success achieved to curb the emissions of ozone depleting substances through the Montreal Protocol, Parties negotiated a new treaty to achieve similar success with greenhouse gasses. The result of this process was the Kyoto Protocol, whose main objective is the *"stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system"* (United Nations, 1998:2). In recognition of the fact that rich industrialised countries are primarily responsible for the high levels of greenhouse gas concentrations in the atmosphere, these countries are expected to shoulder the burden in dealing with the problem.

The main achievement of the Kyoto Protocol is its requirement for meeting an average reduction in greenhouse gas emissions of 5.2% against 1990 levels for thirty-seven industrialised countries and the European Community during the UNFCCC's first commitment period from 2008 to 2012 (see Addendum 5 for more detail on individual country commitments). *"This group target will be achieved through cuts of 8% by the European Union, most Central and Eastern European countries, and Switzerland; 7% by the United States; 6% by Canada, Hungary, Japan and Poland. Russia, New Zealand and Ukraine are to stabilize their emissions, while Norway may increase emissions by up to 1%, Australia by up to 8% and Iceland 10%. The six gasses are to be combined in a 'basket', with reductions in individual gasses translated into CO_2 equivalents (CO_2e) that are then added up to produce a single figure"* (Arquit Niederberg & Saner, 2005:2).

The Kyoto Protocol, adopted on 11 December 1997, only entered into force on 16 February 2005. Its implementation rules – the Marrakesh Accords - were adopted in 2001. It is widely accepted that the Protocol represents a first step in the process of establishing a global regime to stabilise greenhouse gas emissions. Implementation offered an important opportunity to learn lessons and establish the essential architecture of a new system.

In terms of the Protocol, countries' real emissions are monitored. Parties are responsible for submission of emission inventories and national reports to the United Nations' Climate Change Secretariat, who administers a registry system recording trades and transactions under the mechanisms. The Secretariat keeps an international transaction log to prevent transactions inconsistent with Protocol requirements.

Countries are obligated to meet their targets primarily through internal interventions. Three market-based flexibility mechanisms were included to assist countries in meeting their obligations; these are Emissions Trading, Joint Implementation (JI) and the Clean Development Mechanism.

Norway and Germany proposed the idea of a Joint Implementation mechanism during 1991. Met with virtually no resistance, the concept introduced the idea that *"the transfer of technology to other countries to reduce greenhouse gasses could be counted towards the benefit of the source country of the technology"* (Dutschke & Michaelowa, 1998:10). Later on, developing countries became

concerned that such mechanisms would allow rich countries to *"buy their way to compliance. Environmentalists were also uncomfortable with the notion of 'pollution rights' given by the issuance of certificates or permits from JI"* (Dutschke & Michaelowa, 1998:10).

Towards the end of the Kyoto process – during May 1997 - Brazil proposed the introduction of a clean development fund *"financed by industrialised countries non-compliant to the protocol. Due to the 'geographic flexibility' of the proposal, the United States took the opportunity to exercise further flexibility in the implementation of their commitments. The Brazilian proposal would later be transformed into something very closely resembling the JI concept. However, the name Clean Development Mechanism made the concept more palatable to sceptics because of the emphasis on sustainable development in its implementation"* (Silayan, 2005:9).

The Brazilian proposal for a clean development fund would have been available for the benefit of all developing nations. Instead, the final agreement mandated the creation of a mechanism to primarily achieve emissions reductions in non-Annex 1 Parties. *"Because of this subtle transformation, the CDM concept has been understood by many developing countries that such a mechanism would be available and beneficial to not only a few but to all developing nations"* (Silayan, 2005:10). This misunderstanding may be the source of much of the criticism against the CDM relating to its contribution – or lack thereof - to sustainable development.

This issue raises the question on equity in climate change policy which has been debated since the United Nations Framework Convention on Climate Change was crafted. Initially it was known as the so-called North-South debate about whose responsibility it was - based on historical emissions - to lower greenhouse gas emissions. Many poor countries are legitimately concerned that they will be most affected by the impacts of climate change, despite the fact that they have not been responsible for large historical emissions, or will not likely be in the future. *"Moreover, current patterns of development have been largely dependent on the use of fossil fuels and any action to limit and/or reduce GHG emissions in developing countries has been seen as a threat to economic development"* (Silayan, 2005:19).

6.4. EMISSIONS TRADING

In terms of Article 17 of the Kyoto Protocol, countries with mandatory quantitative targets (Annex 1 Countries), *"may participate in emissions trading"* (United Nations, 1998:15). It requires emissions trading to be *"supplemental to domestic actions"* (United Nations, 1998:15) to meet obligations. Article 17 carbon trading - known as 'emissions trading' - is an *"allowance-based transaction system that enables developed countries and countries with economies in transition to purchase carbon credits from other developed countries and countries with economies in transition to fulfil their emissions reductions commitments"* (Hamilton *et al*, 2007:12).

Emission trading is a typical 'cap-and-trade' scheme. A central authority assigns *"...an emission limit for the country, and each source has an emission limit given to it in a national allocation plan. The permits are freely tradable but each source must not, at some designated date, emit more pollutants than it has permits for"* (Pearce, 2007:463). Units of trade are called 'assigned amount units' (AAUs).

The inclusion of eastern European countries like Russia and the Ukraine in this scheme has been controversial. With the collapse of the Soviet Union and subsequently the regional economy during the 1990s, emissions shrank by 40%. As a result, these countries have been able to trade AAUs without making any deliberate effort to reduce their greenhouse gas emissions – hence the reference to trading 'hot air' by many critics. The emissions trading mechanism has resulted in the establishment of the European Union Emissions Trading Scheme (EU ETS), the world's largest multi-national greenhouse gas emissions trading regime.

6.5. JOINT IMPLEMENTATION

In terms of Article 6 of the Kyoto Protocol, Annex 1 countries are allowed to partake in a project-based transaction system trading carbon credits from greenhouse gas reduction projects implemented in another Annex 1 country. The investing country earns the credits for the host country's reductions. Projects are known as joint implementation (JI) projects, while credits *"generated under this scheme are referred to as Emission Reduction Units (ERUs)"* (Bayon *et al*, 2007:7).

Trades cover emission sources as well as sinks[8]. Joint implementation trades must be additional and *"must be supplemental to domestic actions, implying that despite trading, the emphasis must be on domestic reduction activities"* (Pearce, 2007:463). The joint implementation scheme has thus far not played a significant role in the international carbon market.

6.6. CLEAN DEVELOPMENT MECHANISM

The Clean Development Mechanism (CDM) defined in article 12 of the Kyoto Protocol, is one of the flexibility mechanisms designed to eliminate or reduce greenhouse gasses that are or will be emitted in developing countries. In the process, participating developing countries benefit by being placed on *"a development path involving reduced emissions. The objectives of the CDM are both the cost-effective reduction of GHGs and the sustainable development of the host country"* (Silayan, 2005:12). Article 12 of the Protocol defines three objectives for the CDM. These are to:

- Contribute to the overarching goals of the Framework Convention;
- Encourage sustainable development in non-Annex 1 Parties; and
- Reduce the compliance cost for Annex 1 Parties.

Inclusion of the CDM in the Kyoto Protocol achieved the following goals:

- It provides Annex 1 Parties increased flexibility in achieving their targets by allowing them to earn emission credits through project-based activities in developing countries. It thus introduced and mainstreamed the concept of geographical flexibility, as well as flexibility in implementing compliance.
- The CDM promotes greater involvement of non-Annex 1 Parties in climate change negotiations *"by linking the concerns of global climate change to the concerns of local sustainable development. In the end, developing countries benefit from the transfer of*

[8] Sinks refer to the growing of biomass which absorbs, or 'fixes', carbon dioxide from the atmosphere at a faster rate than it emits it.

financial and technological resources while industrialised countries benefit from the certification of emission reductions" (Silayan, 2005:10).

- Added to this is the achievement of the principles set out in article 3 paragraph 4 and 5 of the United Nations Framework Convention on Climate Change whereby *"Parties have the right to, and should promote sustainable development"* (United Nations, 1992:5) and *"Parties should cooperate to promote a supportive and open international economic system that would lead to sustainable economic growth and development in all Parties, particularly developing country Parties"* (United Nations, 1992:5).

6.6.1. BACKGROUND

The CDM concept expands on the ideas of the 'baseline-credit system' for emissions reductions, to include other countries and in particular poorer countries. The CDM *"functions by delivering a subsidy to the developing world in return for lower emissions of GHGs. The subsidy offsets the costs of reducing greenhouse gas emissions, thereby encouraging less developed countries to emit less greenhouse gas than they otherwise would. As such, it represents the first attempt to address a global atmospheric commons problem using a global market"* (Wara, 2006: unnumbered).

Since climate change is a global issue and the atmosphere a globally shared resource, it does not matter where emissions reductions occur, as long as the total global amount of greenhouse gas emissions is reduced. It would therefore be more efficient to reduce greenhouse gas emissions in countries or markets where such reductions would be cheaper. For a variety of reasons, and in particular the price of labour, it is cheaper to meet reduction targets in poorer countries. Therefore *"when a developed country invests in certified emission reduction units in a developing country, it is maximising the reduction cost-efficiency by creating emissions reductions in other countries where reduction is less costly. The targeted amount of reduction is efficiently achieved thereby increasing overall social welfare"* (Silayan, 2005:7).

Like Joint Implementation, the CDM is a project-based transaction system. The only difference between JI and the CDM being that the CDM *"establishes a principle of self-interest from the*

developing countries' point of view, namely that trades must contribute to their sustainable development" (Pearce, 2007:463-464). *"This mechanism is the critical link between developed and developing countries under Kyoto and is the flexible mechanism participants in the voluntary market most often seek to imitate. Accepted CDM projects have become a major influence on 'setting the bar' for offset projects in developing countries"* (Hamilton *et al*, 2007:12).

Carbon offsets originating from registered and approved CDM projects are called Certified Emissions Reductions (CERs). CERs may either be used by Annex 1 Parties to meet their emissions reduction obligations under the Kyoto Protocol (see Addendum 5 for more detail), or by operators of installations covered by the European Union Emission Trading Scheme to comply with their emissions reduction obligations to surrender European Union Allowances (EUAs). CERs may be held by governments or private entities on electronic accounts with the United Nations, and may be purchased on the primary market (i.e. from the original party making the reduction) or the secondary market (resold from a marketplace).

6.6.2. INSTITUTIONAL ARRANGEMENTS

To ensure compliance to CDM rules, domestic and international governance structures have been established.

On the international front, the mechanism is directed by the Conference of the Parties and managed by an Executive Board (EBCDM) include one representative from each UN region (Asia, Latin America and the Caribbean, Africa, Central and Eastern Europe, and the OECD), one from small island developing states, and two each from Annex 1 and non-Annex 1 Parties. The Executive Board's main responsibilities include:

- *"Establishing the ground rules for the implementation of the CDM among participating countries and organisations;*
- *Accreditation of independent operational entities tasked with validation and verification of project activities; and*

- *Reporting and dissemination of pertinent information relating to all aspects of the CDM"* (Silayan, 2005:12).

Host countries appoint a designated national authority (DNA), acting as the first point of contact for project developers. The DNA is usually housed in a government department, staffed with public sector employees and is responsible for the initial review and approval of proposed CDM projects.

The CDM's complex institutional arrangements have been criticised for escalating transaction costs associated with the approval process. *"Transaction costs and institutional rigidities will reduce the attractiveness of the Kyoto Protocol flexibility mechanisms compared to domestic greenhouse gas abatement options. The CDM in particular is likely to entail considerable costs of baseline development, project registration, verification and certification"* (Michaelowa & Jotzo, 2005:511).

Transaction costs influences the number of approved CDM projects. Early evidence indicates that transaction costs can account for a significant share of the total cost of CDM projects. *"Transaction costs tend to increase as one move to project categories with higher implementation costs, and smaller projects will be at a disadvantage because fixed costs become a major factor"* (Michaelowa & Jotzo, 2005:521-522).

6.6.3. THE CDM PROJECT CYCLE

The CDM project cycle essentially involves six steps as illustrated in figure 6.2.

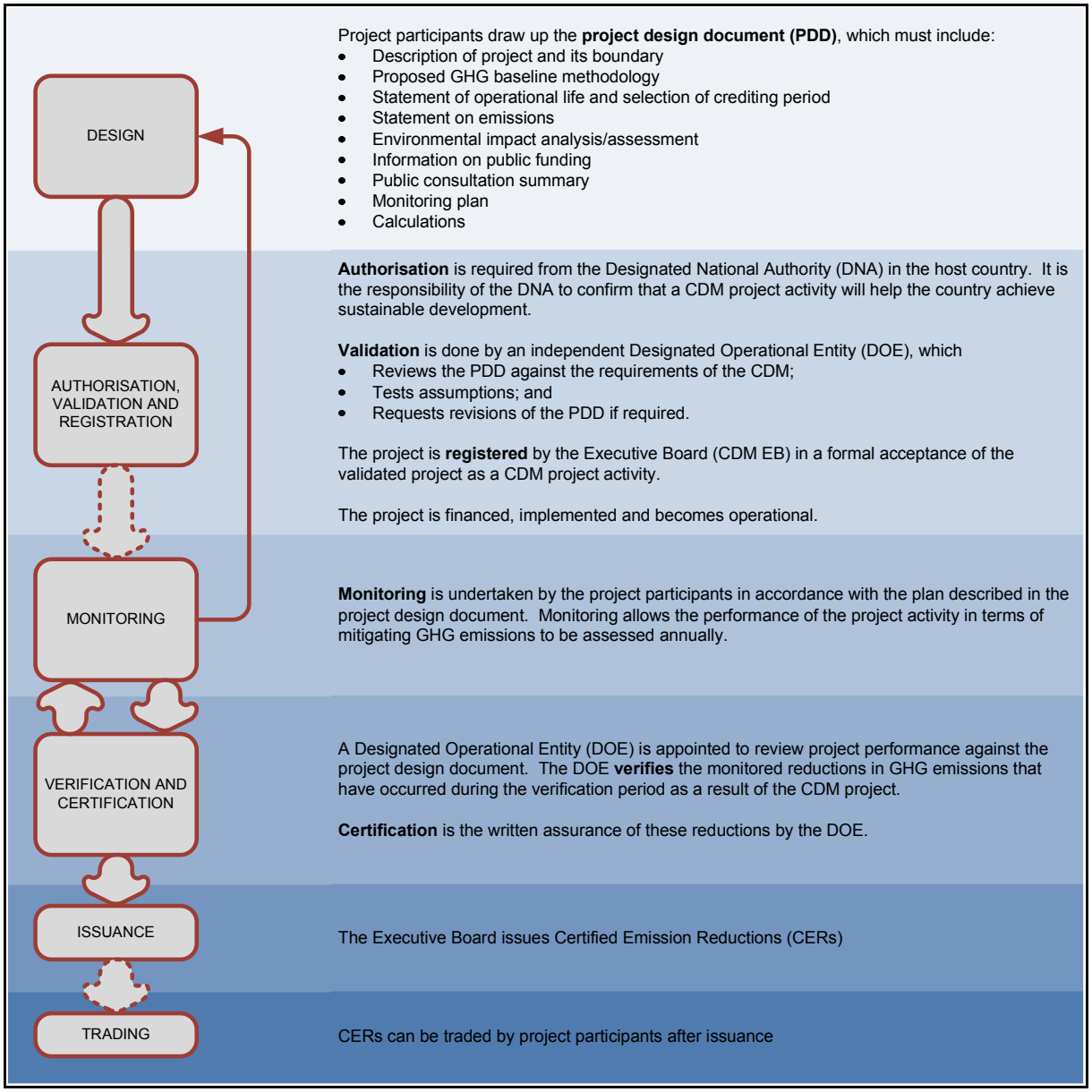


Figure 6.2 | Sequential steps in the CDM project cycle (Source: Energy Research Institute, 2002:16)

6.6.2.1. PROJECT DESIGN

Project developers are expected to submit a project design document (PDD) to the DNA for review. *"The project design document sets the context for all the following steps and sets the amount of CERs likely to arise from the project"* (Energy Research Institute, 2002:18).

The PDD includes information on:

- The purpose of the project;
- The technical aspects of the project;
- The proposed baseline methodology, including
    - The approved methodology selected and how it will be applied; or
    - A new methodology and a justification of the choice;
- The estimated operational lifetime of the project and the selected crediting period;[9]
- How anthropogenic emissions of GHGs will be reduced;
- Environmental assessments;
- Public funding from Annex 1 Parties, together with an declaration that such funding will not divert official development aid;
- Comments by local stakeholders;
- The monitoring plan; and
- Calculations, including a description of formulae used to calculate and estimate anthropogenic emissions of GHGs.

Some jurisdictions, such as South Africa, allow project developers to submit a project identification note (PIN) as a first step, giving the developer a sense of how the DNA will view the proposed project before incurring the cost of submitting all the information required by the PDD.

6.6.2.2. AUTHORISATION, VALIDATION AND REGISTRATION

The proposed CDM project must be authorised by the host country. Once the PDD is approved by the DNA, it issues a letter of approval and forwards the application to a Designated Operational Entity (DOE). Unlike DNAs, DOEs are all private sector entities accredited to authorise a specific portfolio of

[9] Project participants may select a crediting period from the following options

- A maximum of 7 years with the option to renew; or
- A maximum of ten years with no option to renew.

methodologies. The DOE decides whether *"the project's methodology is in line with approved methodologies, the claimed emissions reductions and baseline scenarios are accurate, and the project is 'additional'. In making its determination, the DOE will also post the PDD on the internet for a 30-day public comment period"* (Bond *et al*, 2007:16).

On approval by the DNA and the DOE, the CDM Executive Board reviews their findings and makes a final decision whether to allow the project to start generating Certified Emissions Reductions. Registration follows a final thirty day period for public comment. With limited available resources the Executive Board are not in a position to closely scrutinise every project submitted for approval, relying heavily on the decisions and recommendations of DOEs. In practice the Executive Board only deals with problem cases.

6.6.2.3. MONITORING

Monitoring is an essential part of the CDM project cycle, enabling the measurement of the greenhouse gas emissions from the project *"to be determined against both the plan and the baseline"* (Energy Research Institute, 2002:22).

The monitoring plan included in the project design document, must use a methodology that is considered appropriate by the DOE, has been successfully used on other projects and is considered good monitoring practice. It must provide for:

- *"The collection and archiving of all necessary data for measuring or estimating GHG emissions occurring within the project boundary*[10] *during the crediting period.*
- *The collection and archiving of all necessary data for determining the baseline of GHG emissions occurring within the project boundary during the crediting period.*

[10] "The project boundary includes all emissions of greenhouse gasses under the control of the project participants that are significant and reasonably attributable to the CDM project activity" (Energy Research Institute, 2002:19).

- *The identification of all potential sources of, and the collection and archiving of data on, increased GHG emissions outside the project boundary that is significant and reasonably attributable to the project activity.*
- *Quality assurance and control procedures for the monitoring process.*
- *Procedures for the periodic calculation of reductions in GHG emissions and leakage effects"* (Energy Research Institute, 2002:22).

Provision is made for the use of simplified procedures for small-scale projects.

6.6.2.4. VERIFICATION AND CERTIFICATION

A DOE will review and determine the monitored reductions in emissions of greenhouse gasses that have occurred as a result of a registered CDM project during the verification period. The project participants will generally select and contract a different DOE to the one involved in the earlier stages of the project cycle.

Verification involves:

- Determining whether project documentation follows the requirements of the project design document;
- Determining the reductions in emissions that have occurred as a result of the project using the procedures described in the project design document and in the monitoring plan;
- Reviewing the monitoring results and verifying that monitoring methodologies have been applied correctly, and documents are complete and transparent;
- Conducting on-site inspections; and
- Providing a verification report which will be available publically.

"Verification and issuance are repeated several times during the crediting period, which can be chosen as fixed (duration 10 years) or renewable (up to three times 7 years, with obligation to reassess the baseline after 7 and 14 years). The rhythm of verifications is defined by the project owner; it is mostly conducted annually" (Muller, Zerzawy & Wirth, 2010:6).

Certification is the written assurance by the DOE that a project achieved verified reductions in anthropogenic greenhouse gas emissions during a specified period.

6.6.2.5. ISSUANCE

The DOE's certification report will request the Executive Board to issue CERs equal to the amount verified, who in turn will instruct the CDM registry administrator to issue the specified quantity of CERs. Following this issuance, the administrator will:

- Transfer an appropriate share of the CERs to cover administrative and help meet adaptation costs, to the appropriate accounts in the CDM registry; and
- Transfer the balance to the accounts in the CDM registry of country investors and project participants.

Unless the Board or a project participant requests a review, the issuance is considered final after fifteen days. A review may only be requested on suspicion of fraud, illegal action or incompetence by the DOE.

6.6.2.6. TRADING

CERs represent the carbon income from a project. Most trades involve a simple transaction between the owner of the CERs and the buyer. Various other types of transactions may take place in the market similar to other traded commodities. Purchases of yet-to-be-generated CERs can be done through forward contracts or call options to purchase a specified amount of CERs generated by a CDM project upon delivery, sometimes with some up-front payment. Trading in CERs on secondary markets includes spot or options transactions in existing CERs.

6.6.4. ASSET CLASSES

In addition to carbon dioxide (CO_2), five gasses contributing to the greenhouse effect (listed in table 4.1) are recognised under the Kyoto Protocol and generally traded. This is based on a schedule developed by the Intergovernmental Panel on Climate Change (IPCC) determining *"the global warming potential (GWP) of each gas in terms of its equivalent in tons of CO_2 over the course of 100 years"* (Bayon *et al*, 2007:4).

The United Nations Framework Convention on Climate Change deals with 5 economic sectors responsible for the majority of anthropogenic greenhouse gasses in the atmosphere. These are energy, industrial processes, agriculture, land-use, land-use change and forestry (LULUCF) and waste (see Table 6.1 for an overview of eligible CDM projects under the Kyoto Protocol).

Table 6.1 | Eligible CDM projects under the Kyoto Protocol

Energy Supply (CO_2, CH_4 and N_20)
1. Cleaner-coal power generation technology 2. Hydro-electricity to replace coal-fired power generation 3. Co-generation (hybrid systems e.g. biomass or fossil-fuel based) 4. Renewable energy a. Wind b. Photovoltaic c. Biomass d. Coal to gas e. Methane from landfill sites 5. Use of forest and agricultural wastes to generate electricity and heat
Manufacturing (CO_2, N_2O, HFC_5, PFC_5 and SF_6)
1) Conversion of boilers from coal to gas 2) Industrial energy efficiency 3) Structural change to less energy- and emissions-intensive industries

Mining (CO_2, CH_4)
1. Industrial energy efficiency
2. Reducing methane emission from coal mines
3. Control of coal dump fires
4. Agriculture and forestry
5. A forestation and reforestation
Transport and Communications (CO_2)
1. Improved public transport
2. Improved urban planning and traffic management
3. Improved fuel switching
4. Switching from road to rail transport
Residential, Commercial and Government Buildings (CO_2)
1. Energy-efficient appliances
2. Solar water heating
3. Fuel switching in households and commercial boilers
4. Energy efficient building design
5. Energy management

Source | adapted from UNDP, 2003:6&7

A significant trend in the compliance carbon markets is the predominance of non-carbon related projects. While the majority of projects are in renewable energy, they have accounted for only a small percentage of issued CERs. By contrast, industrial gas destruction projects, in particular nitrogen (N_2O) and hydroflorocarbons (HFC_{23}), represent less than 2% of the total number of projects yet are responsible for the vast majority of issued CERs (Bond *et al*, 2007:18). It is projected to *"represent 40% of expected deliveries by 2012 in the CDM pipeline"* (Capoor & Ambrosi, 2007:28).

This may not be surprising since they do represent the 'low-hanging fruit' in greenhouse gas concentration abatement. HFC_{23} - 11,700 times more effective as a greenhouse gas than CO_2 - are particularly profitable. Since CERs are measured in CO_2 equivalent (CO_2e) a relatively small amount

of HFC_{23} captured, can create a large amount of credits. These types of projects *"...are attractive since they are less capital intensive than for example, renewable energy projects and they are generally 'quick and common practice additions to existing facilities'"* Taiyab (2006:6).

Trade in methane is equally split between coal mine methane and landfill gas. A third asset class – clean energy – has become the biggest in recent years. It includes renewable energy, energy efficiency and fuel switching projects.

"As the sectors are defined, greenhouse gas removals from the atmosphere occur only in LULUCF, because of biomass growth. This results in specific accounting characteristics which make the LULUCF sector distinct from the rest" (Schlamadinger, 2007:273). Their regulatory complexity and limited market access to the European Union's Emissions Trading Scheme is problematic, even though their reported community benefits and competitive cost may result in some additional demand from buyers. *"Large classes of LULUCF assets including possibly soil sequestration, fire management and avoided deforestation, among others, remain attractive opportunities to promote sustainable development in Africa and in other natural resource-based economies"* (Capoor & Ambrosi, 2007:28-29). Demand for carbon assets from LULUCF is marginal, representing less than 1% of trades in 2008.

6.6.5. STANDARDS

The CDM Executive Board requires projects to comply with its additionality and project design rules, as well as host country standards of sustainable development. *"Fearful that this arrangement would lead to an inconsistent standard of quality in terms of sustainable development, as some governments may be less stringent in their criteria, a group of NGOs, led by the World Wildlife Fund (WWF), have created the CDM Gold Standard"* (Taiyab, 2006:10-11). Projects must pass through three screens in order to meet the Gold Standard:

- The project type screen, restricted to renewable energy and end-use energy efficiency projects;

- An additionality and baseline screen; and
- A sustainable development screen, which involves costs and benefits associated with other environmental, economic and social impacts.

The Gold Standard certification process is done by a DOE on completion of the standard CDM verification process, using the additional Gold Standard guidelines. Voluntary projects may also apply for Gold Standard certification by following the guidelines and receiving validation from an accredited organisation.

Gold Standard certification offers a competitive advantage to projects by assuring buyers of a project's credibility and its contribution to sustainable development. It also reduces reputational risk arising from criticism by regulators and NGOs scrutinising companies claiming emissions credits. This will theoretically translate into *"a price premium for sellers, as it is expected that buyers will pay more for higher quality credits. Adopting the Gold Standard certainly assures an even higher level of quality, but, of course, is even more expensive than following the normal CDM guidelines"* (Taiyab, 2006:11).

Since the Gold Standard excludes LULUCF projects, the Climate, Community, and Biodiversity Alliance developed a Gold Standard equivalent - called the Climate, Community, and Biodiversity Standards - for projects in this asset class.

6.6.6. GROWTH AND DEVELOPMENT

During the short period carbon markets have been operating, they have grown exponentially. An important reason for this was the establishment of compliance markets in response to the Kyoto Protocol. Regulation forced polluters to carry the full social cost of their actions. By putting a price on pollution, it created an incentive to pollute less.

With Joint Implementation playing a minimal role, CDM projects dominate the global project-based carbon market. *"The CDM pipeline now consists of over 4,500 projects in about 80 countries, with an increasing number from countries in Sub-Saharan Africa. The biggest contribution of CDM has been*

to capture the imagination and ingenuity of governments and companies in developing countries to view climate change mitigation as an opportunity instead of a constraint to growth" (Capoor & Ambrosi, 2009:45). The pipeline grew to 5 354 by October 2010, as demonstrated in table 6.2.

Table 6.2 | Global CDM pipeline

Status of CDM projects	Number of Projects
At validation	2954
Request for registration	56
Request for review	36
Correction requested	57
Under review	26
Total in the process of registration	**175**
Withdrawn	49
Rejected by EB	173
Validation negative by DOE	162
Validation terminated by DOE	751
Registered, no issuance of CERs	1622
Registered. CER issued	778
Total registered	**2400**
Total number of projects (incl. rejected & withdrawn)	**6664**

Source | UNEP, 2010:11

Demand for the primary CDM market contracted during 2008 and 2009 (as seen in table 6.3) as a result of the global financial turmoil. As emissions contracted in line with the contraction in the global economy, demand for Kyoto assets fell, since most Annex 1 Parties are now on course to meet or surpass their emissions reductions commitments (Kossoy & Ambrosi, 2010:37). *"On the supply side,*

origination activity declined in 2009 as the financial crisis spurred financial institutions and private investors to deleverage and redirect their positions away from risky investments" (Kossoy & Ambrosi, 2010:37). Developers thus found it difficult to initiate new projects.

"CDM continued to leverage clean energy investments in 2008 through projects in renewable energy, fuel switching and energy efficiency. Transacted volumes in these three broad project categories alone totalled 323 $MtCO_2e$ (slightly down from 359 $MtCO_2e$ in 2007), accounting for 82% of volumes contracted in 2008" (Capoor & Ambrosi, 2009:40).

Table 6.3 | Annual volumes and values (2007-08) for project-based transactions

	2007		2008		**2009**	
	Volume ($MtCO_2e$)	Value (Million $)	Volume ($MtCO_2e$)	Value (Million $)	Volume ($MtCO_2e$)	Value (Million $)
Primary CDM	552	7,433	404	6,511	211	2,678
Secondary CDM	240	5,451	1,072	26,277	N/A	N/A
Total	**792**	**12,884**	**1,476**	**32,788**	**N/A**	**N/A**

Sources | Adapted from Ambrosi & Capoor, 2009:31; Kossoy & Ambrosi, 2010:37.

6.6.7. PRICE TRENDS

In total 221 million tons were contracted on the primary CDM market in 2009, which represented a 48% decline on 2008 volume and a 62% decline on 2007 volume. However, since the Great Recession affected both supply and demand, the pressure on prices were not as significant as on volumes.

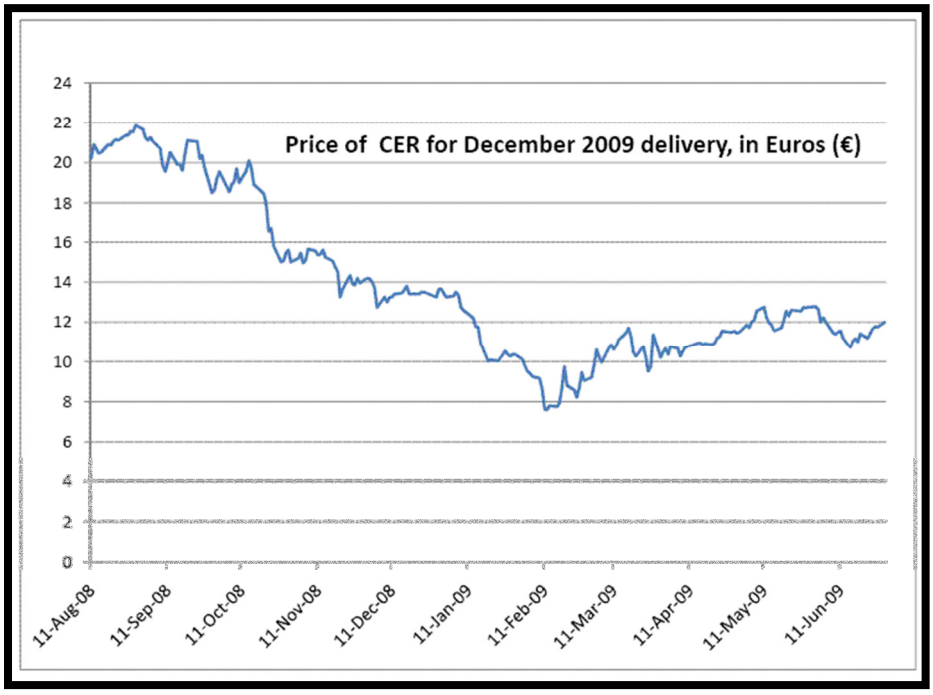


Figure 6.2 | CER price movements (Source: Climate Progress, 2009:unnumbered)

"Prices averaged $12.7 per ton (€9.1), a still relevant 21% decline compared to the $16.1 average in 2008" (Kossoy & Ambrosi, 2010:39). This is roughly in line with the price band reported by the South African DNA for South African assets of €12 to €22 per tCO_2e (Rambau, 2010).

CER prices are determined by prevailing market dynamics as well as various risk factors influencing a specific project. Sellers in a position to take on project risk may reap the benefits of a higher CER price, while buyers who are willing to invest in project with a higher risk profile, may benefit from lower prices.

According to TFS Green[11] (2010:unnumbered), specific factors affecting CER prices include:

[11] TSF Green is a subsidiary of 'Compagnie Financière Tradition', one of the world's three largest brokers in financial and commodity-related products.

- The price of European Union Allowances (EUAs). The European Union Emissions Trading Scheme, being the most established emissions trading system, provides the pricing benchmark for many purchasers.
- Credit. As a result of the long-term nature of CER contracts, the supplier and purchasers' financial position is important. Since role-players from non-Annex 1 Parties may not always have the necessary credit rating, and since *"both parties are often reluctant to foot the additional expense of a Letter of Credit (in many cases with good reason), it is not surprising that price negotiations often depend on how this issue is approached and managed. A good credit rating by a recognised agency is often beneficial, as it is perceived as an indication of the effectiveness of the seller in successfully executing project activities outside of the CDM*" (TFS Green, 2010:unnumbered).
- Terms and conditions of the sales agreement, including *"delivery guarantees offered by the seller, volumes likely to be generated, the use of an established methodology, who bears the costs of developing CDM documentation (the PDD), project validation and registration, and any upfront payments which may be required"* (TFS Green, 2010:unnumbered).
- Stage of project development. Projects more advanced in the project cycle are more likely to generate CERs and would probably attract higher prices.
- Risk factors such as:
    - Sovereign risk, including factors such as the host country's conventional investment risk profile, and the efficacy of the designated national authority. Not only does the DNA determine if projects will obtain national approval, but is a determining factor in whether a project are likely to meet the Executive Board's standards for registration.
    - Quality risk, where the project may run into problems like sustainability or additionality concerns. Standards like the CDM Gold Standard indicate high-value, high-quality projects, since it is likely to have addressed potential problems.
    - Delivery risk, where the project may fail to generate the expected number of CERs. This may happen for a variety of reasons, such as lower than anticipated efficiencies, leading to an under-delivery of committed volumes.
    - Registration risk resulting from the CDM approval process.

- Access to market. In the main, more market exposure lead to higher bids, as a result of the competitive nature thereof.

6.6.8. CDM PROJECT DISTRIBUTION

"Applying the economic theory of emissions trade on an international scale involving a variety of nations in varying stages of development manifests a complex problem. Imposing a market mechanism on countries with different levels of competitiveness creates a trading environment conducive to imperfect competition whereby only a few nations benefit, and overall social welfare decreases" (Silayan, 2005:8). This can be seen in the global distribution of CDM projects (illustrated in figure 6.4) which is heavily concentrated in large developing countries led by India, China and Brazil. China, India and Brazil also dominate in the number of CERs issued as reflected in table 6.4.

Table 6.4 | Countries with the most CERs issued

Top countries by issued CERs	Total CERs (million)	Share
China	153	46%
India	72	22%
South Korea	44	13%
Brazil	35	10%

Source | Müller, Zerzawy & Wirth, 2010:8

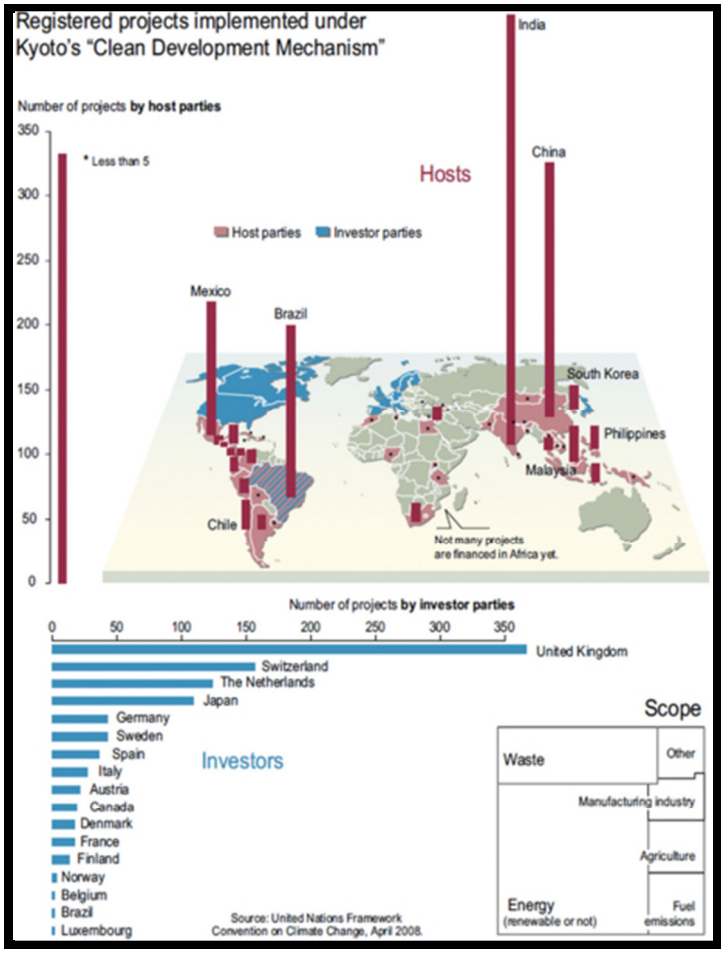


Figure 6.4 | Distribution of CDM projects (Source: UNFCCC, 2009:unnumbered)

CDM project distribution is influenced by a number of factors. The most fundamental are the entry conditions for a country's participation in the CDM which have been *"explicitly negotiated and written in the context of climate change negotiations. These conditions can be regarded as the official conditions for participation, namely: (1) a country's ratification of the Kyoto Protocol, and (2) a host country's establishment of a CDM focal point, known as the Designated National Authority"* (Silayan, 2005:22). Countries which do not comply with these will not be able to participate and therefore benefit from the CDM.

Besides the official conditions there are unofficial conditions for participation, including a minimum amount of annual emissions, the existence of baseline data, and in-country capacity.

Table 6.5 | Implementation conditions and their impact on CDM project distribution

Participation Conditions		Effect on CDM Project Distribution
Official Conditions	Kyoto Protocol ratification	Excludes countries from participation in the Kyoto Protocol mechanisms
	DNA establishment	Excludes countries from participation in the CDM
Non-official Conditions	Reasonable amount of annual GHG emissions	Countries with low annual emissions excluded, because of optimal size for projects necessitated by high transaction costs
	Existence of baseline data	Countries with no baseline data excluded
	Local capacity	• Ability to initiate local project development • Increased competence in project implementation • Minimise risk perception by investors • Investors attracted to countries with better overall competence in project execution and delivery • Efficient project evaluation procedure minimise transaction costs • Lower transaction costs attract investors

Source | Silayan, 2005:32

"If CDM can indeed be understood as a market mechanism, simply put, projects will go to countries with the best opportunities for emissions reduction. Since success in the case of the CDM framework is measured in terms of reduced emissions, the first investment option will be to countries with high reduction potential" (Silayan, 2005:24). Jung (2005) assessed 114 countries on their attractiveness to host CDM projects. The criteria included *"emission reduction potential, institutional CDM capacity and general investment climate"* (Jung, 2005:4). The results of the study indicated that China, India, Brazil, South Korea, Indonesia, Mexico and South Africa have the highest potential for CDM projects (see Addendum 6 for a comprehensive list). A significant finding from this study was the general

unattractiveness of African countries, other than South Africa, as CDM investment destinations (Jung, 2005:19).

"It is generally accepted that Africa will not be a major earner of CERs on a global scale" (Lotz *et al*, 2009:230). Despite this, the African CDM market was expected to *"grow from 34 projects in 2009, to well over 100 projects by 2015"* (Prinsloo, 2010:unnumbered). It is estimated that Africa may eventually attract between 4% en 14% of the global CER market during the first commitment period (Lotz *et al,* 2009:230).

The distribution of CDM projects is consistent with current flows of foreign direct investment. The correlation between flows of FDI and CDM project development is not accidental, since *"larger countries with more stable investment climates and greater capacity are logically more attractive to profit driven investors"* (Taiyab, 2006:6). In keeping with this trend, South Africa dominates the African scene, with small poor countries entirely left behind.

Although it was generally assumed that CDM investments will follow the pattern of foreign direct investment flows, Arquit Niederberger and Saner (2005) criticises the assumption as to simplistic. They argue that *"current trends in FDI flows give some indication of the preference of foreign investors. One element in common with the CDM is the quality of the general business environment. However, for a number of reasons, FDI flows do not necessarily reflect CDM market potential"* (Arquit Niederberger & Saner, 2005:16). A factor they argue will influence this is the fact that CDM demand originates from governments as well as the private sector. Their motivations and preferences may differ.

The reason for Chinese leadership of the CDM process may be, according to Szymanski (2002:27), because China in particular sees the CDM *"...as a way to attract more foreign investment, with the added (though perhaps secondary) benefit of obtaining a cheap fix for some of its domestic environmental problems."* The favourable carbon investment climate characterised by strong institutional support and experienced project developers, combined with economies of scale in exploration, sourcing and transaction costs, makes the large emerging markets attractive, making it difficult for poor countries to compete.

6.6.8. CDM AND SUSTAINABLE DEVELOPMENT

Since the CDM is a market based instrument, it was expected to follow the *"dynamics of foreign direct investment and be governed (and constrained) by the forces which apply to FDI in general. However as the CDM has an explicit goal of promoting sustainable development (unlike general FDI) there may be some innovative investments driven by the sustainable development goals as well as the greenhouse gas reduction goals"* (Huq, 2002:10). The sustainable development requirement in Article 12 (2) represented a *"hard fought victory by many of the countries and environmental NGOs that were initially against the CDM"* (Bond *et al*, 2007:16). Of the three goals the Kyoto Protocol established for the CDM, its contribution to the sustainable development of poor countries remains the most controversial.

This controversy may be the result of a difference in understanding of the term sustainable development, complicated by the fact that the Protocol is silent on the meaning thereof. In subsequent meetings of the Conference of the Parties, countries have been allowed to set their own definition of and criteria for sustainable development. Thus the debate on whether the CDM is fulfilling this objective is problematic, since often host countries have *"very different criteria for assessing the sustainable development contribution of CDM projects. These can range from a 'minimal compliance' approach to a 'context specific' approach where concerns are focussed on national priorities, to a more 'operationalised or comprehensive' approach assessing all types of sustainability (economic, social, environmental)"* (Pfeifer & Stiles, 2009:4).

A 'minimal compliance' approach would involve a host country assessing a project's contribution to its sustainable development exclusively against national targets for renewable energy to reduce dependence on fossil fuels. It may also simply define sustainability as *"meeting the country's environmental impact assessment guidelines"* (Pfeifer and Stiles, 2009:4).

A context specific approach is reflected in the Chinese experience where Zheng (2004:229) argues that even though *"...the climate change issue may not be given a high priority on the political agenda in China, greenhouse gas emission reduction measures such as projects under the CDM can be*

consistent with national development goals and relevant policies" (Zheng, 2004:299). It is attractive since *"CDM is perceived as a new, market-oriented, innovative and flexible financing instrument"* (Gantsho & Karani, 2007:1). The result of this is a situation in which the *"CDM project portfolio is mainly determined by the economic attractiveness and potential and risk of the mitigation options"* (Schneider, 2007:10).

Some African countries, such as Morocco and South Africa, have followed the 'comprehensive' approach and developed *"complex, multi-criteria screening systems, and included priority sectors and project types as part of the DNA assessment process"* (Pfeifer & Stiles, 2009:4).

Many countries established and published project assessment criteria; some of which are very ambitious. In most countries, projects do not need to comply with all or the majority of the criteria for sustainable development. Even complying with one of them – for example creating employment - would be acceptable.

Even though many commentators criticise the CDM for failing to sufficiently fulfil its objective of assisting host countries in achieving sustainable development, *"...a number of projects have indirect benefits for the overall economy, as many projects create employment, indirectly improve the infrastructure or at least provide CER revenues to the economy"* (Schneider, 2007:47). *"A recent survey of DNA representatives has shown that the CDM can contribute to SD in many different ways: through the diversification of energy supply, reduced dependence on fossil fuels, increased reliability of energy supply, increased access for rural populations to modern energy sources and job creation, and improving the social livelihoods in the region where the project is taking place"* (Pfeifer & Stiles, 2009:4). Ultimately, the most important contribution the clean development mechanism is making to sustainable development is contributing to a reduction of greenhouse gas emissions.

6.7. CONCLUSION

In response to the United Nations Framework Convention on Climate Change (UNFCCC), resulting from the 1992 United Nations Conference on Environment and Development, and the subsequent

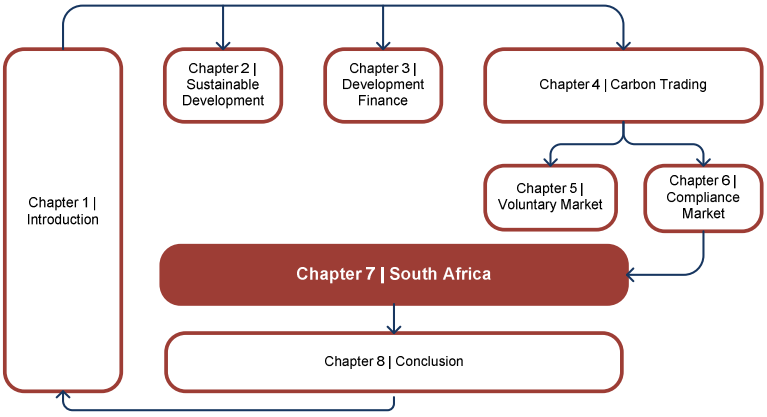
Kyoto Protocol, a number of regulated carbon markets emerged. The main purpose of the Convention and the Protocol is to stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous climate disruption.

The main achievement of the Kyoto Protocol is its requirement for meeting an average reduction in greenhouse gas emissions of 5.2% against 1990 levels for thirty-seven industrialised countries and the European Community. Even though it is generally recognised that this level is far too low to prevent the dangerous disruption of the global climate, it is nevertheless important because it represents the first step towards a comprehensive global climate regime.

Towards the end of the Kyoto process Brazil proposed the introduction of a clean development fund to be financed by industrialised countries non-compliant to the protocol. This idea, which was generally acceptable to poor countries, later morphed into the Clean Development Mechanism, designed to primarily achieve emissions reductions in non-Annex 1 Parties. Misunderstanding or resentment of this change may be the source of much of the criticism against the CDM relating to its contribution – or lack thereof - to sustainable development.

Of the three flexibility mechanisms, the CDM is the most successful. It has grown to be the world's largest project based carbon transaction system. The CDM is characterised by complex institutional arrangements, which has a negative impact on transaction costs. Despite that the CDM market has grown rapidly over the last several years. Like other economic activity, it has been severely affected by the Great Recession, leading to a contraction in traded volumes in both 2008 and 2009.

The most controversial issue is still the CDM's contribution to sustainable development. The fact that host countries define their own criteria for measuring sustainable development is problematic, complicating the debate. Ultimately, the CDM's role in avoiding or reducing greenhouse gas emissions is the most important contribution it can make to sustainable development.



7.1. INTRODUCTION

In this chapter the South African experience with the Clean Development Mechanism will be investigated. South Africa's emissions profile, CDM role-players, the country's sustainability criteria, its strengths and weaknesses as an investment destination and the potential size of the CDM market is discussed. Lastly social housing and the possible contribution of the CDM to social housing delivery is briefly examined.

7.2. BACKGROUND

The global events of the early 1990s, lead to a radical political change in South Africa in 1994. This had the added advantage of allowing the country to take a decisive step away from some long terms trends impacting its sustainability. Sweeping political, economic and social changes attempted to reverse long-terms trends created during the 19th and 20th centuries. This has been accompanied by what the Department of Environmental Affairs and Tourism calls an *"increasing commitment to sustainable development"* (South Africa, 2006(a):16).

Section 24 of the South African Constitution obligate stakeholders to *"secure ecologically sustainable development"* (South Africa, 1996:1251). The Constitution set in motion a process to develop a range of policies and procedures to give effect to this requirement.

As part of this process, South Africa ratified the Kyoto Protocol in 2002. The country is considered a non-Annex 1 Party with no binding emission reduction targets for the first commitment period between 2008 and 2012. However, South Africa is one of the largest emitters of greenhouse gasses globally relative to the size of its population and economy (SAICA, 2009:3). Thus action to reduce greenhouse gas emissions by the country will likely be required in the near future.

7.3. SOUTH AFRICA'S EMISSIONS PROFILE

In comparison with other major emerging markets, South Africa's greenhouse gas emissions intensity is relatively high; it emitted 0.96 kg of CO_2 per dollar of gross domestic product (GDP) in 1999 compared to the non-OECD average of 0.66 kg (UNIDO, 2003:9). In fact the country is among the top five developing world emitters (Carbon Positive, 2008:1), contributing 1.2% of global greenhouse gas emissions. South Africa is ranked 13th globally in terms of total CO_2 emissions (Ehlers & Wiekert, 2006:5), 47th on a per capita basis, and as a ratio of GDP 21st.

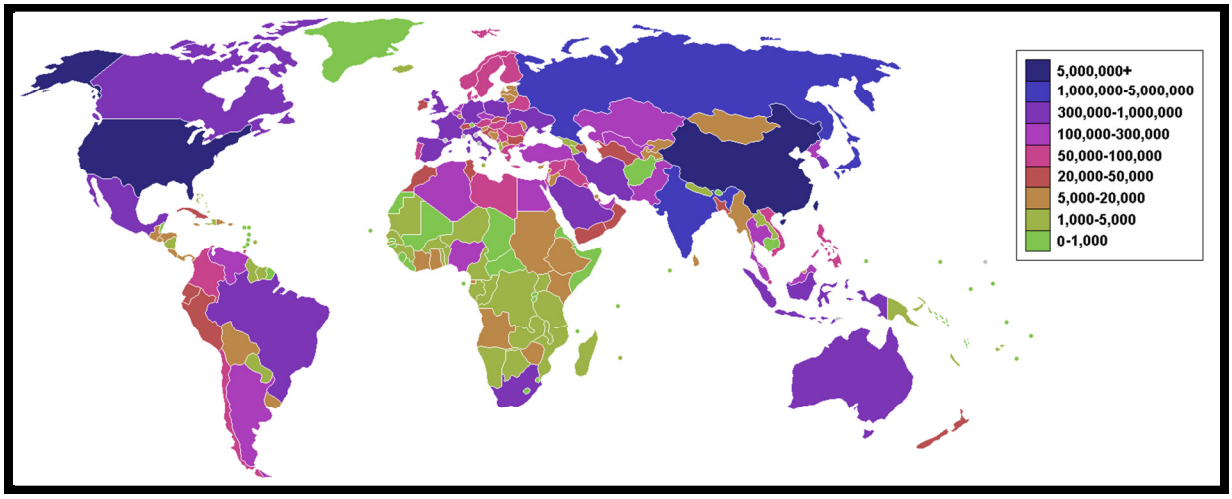


Figure 7.1 | Countries by total CO_2 emissions (Blue highest) (Source: Wikipedia, 2009(b):unnumbered).

In the African context, South Africa is responsible for 41.9% of the greenhouse gas emissions on the continent, making it the worst African emitter by far (Goldblatt *et al*., 2002:24). Carbon dioxide contributed about 80% of South Africa's total greenhouse gas emissions in 2004 (Energy Information Administration, 2006:unnumbered). The country's reliance on its abundant coal resources as a source of energy (electricity and synthetic fuels) is the main reason behind this emissions profile. The reliance on coal is compounded by a relatively high proportion of energy intensive industry and mining, as well as the inefficient use of available energy.

7.4. CDM IN SOUTH AFRICA

South Africa is classified as a developing country for the purposes of the United Nations Framework Convention on Climate Change. From the developing country perspective, the CDM offers the following opportunities:

- *"It can attract capital for projects that assist in the shift to a more prosperous but less carbon-intensive economy.*
- *It encourages and permits the active participation of private and public sectors.*
- *It can be an effective tool of technology transfer if investment is channelled into projects that replace old and inefficient fossil fuel technology or create new industries in environmentally sustainable technologies.*
- *It can help developing countries define investment priorities in projects that meet their sustainable development goals"* (South Africa, 2010(c):9-10)

In South Africa, the CDM may provide additional investment for the development of activities that reduce the combustion of fossil fuels, reduce methane emissions and improve land use patterns. This investment, which is directly related to the extent to which emissions are reduced, could make some businesses in South Africa more viable (South Africa, 2010(d):10).

Bond (2007:79) argues that South Africa should be a preeminent carbon finance investment destination for three main reasons. Since South Africa is the only African country seriously engaged

in the CDM project development process, it is enormously important to make a success of these projects. Failure will have serious implications for the carbon market on the rest of the continent. Also *"South Africa's variety of methodologies and project developers is relatively representational of the global carbon market even though it has much fewer projects than some other countries"* (Bond, 2007:79). The variety of methodologies employed creates an absorption capacity often lacking in most emerging markets. A third reason relates to South Africa's heavy reliance on dirty fossil fuels to satisfy its energy needs. Jung (2005:22) confirmed South Africa's competitiveness, rating the country as 'very attractive', placing fifth globally (see Addendum 6 for more detail).

According to the Department of Energy (DoE), which houses the South African Designated National Authority, 171 CDM projects have been submitted for their approval by the end of October 2010 (see Addendum 7 for a complete list). Of these, 17 have completed the process of registration with the CDM Board, of which 4 have issued CER's, with the balance still at various stages of the project cycle. Projects submitted for review and approval to the DNA include the following types:

- bio-fuels,
- energy efficiency,
- waste management,
- cogeneration,
- fuel switching, and
- hydro-power.

They involve the manufacturing, mining, agriculture, energy, waste management, housing and residential sectors (South Africa, 2010(a):1).

7.4.1. ROLE-PLAYERS

7.4.1.1. PRIVATE SECTOR

Information on the private sector CDM role-players in South Africa is not readily available. The Designated National Authority published a database of 49 private sector project developers on its website (South Africa, 2010(e):unnumbered).

An industry association - the South African Clean Development Mechanism Industry Association (SACDMIA) - was formed on 9 November 2007 (25 Degrees in Africa, 2007:unnumbered). It was intended to be a mechanism through which CDM industry role-players could promote their interests, including marketing of CDM, investment promotion and capacity development. It would seem like the association has never really gotten off the ground, since no further activities or information is listed for it.

7.4.1.2. GOVERNMENT

Government's role is central to the effective functioning of the CDM. The country's ability to engage with the CDM process is a direct result of Government's decision to ratify the Kyoto Protocol. This political commitment by government *"creates the necessary legal basis for the property rights South Africa now has over its emissions. In other words previously valueless emissions now have a (negative) value attached to them and hence now reductions in these emissions now have a positive value"* (Goldblatt *et al*, 2002:115).

A fundamental requirement of the CDM is the need for projects to contribute to achieving sustainable development based on host governments' definition of the concept. Government is the only institution *"that has the authority to weigh up public benefits and costs in an assessment of whether a project contributes to sustainable development or not"* (Goldblatt *et al*, 2002:115). Government thus determines the nature and scope of CDM projects, as well as the allocation of property rights over greenhouse gas emissions reductions.

The national government must thus perform a set of key functions to facilitate the creation of credible CDM projects. These include:

- CDM project evaluation and approval;
- Assessment of project verification reports; and
- Governance of the sale and transfer of CERs.

To allow CDM projects to occur, host countries need to designate national authorities. A regulation under Section 25 of the National Environmental Management Act, 1998 (Act 107 of 1998) establishing the DNA was gazetted on 24 December 2004 by the Minister of Environment and Tourism. South Africa's DNA is the Director General of the Department of Energy, with delegated authority to a structure within the Department (see figure 7.2 for more detail). The main task of the DNA is to assess potential CDM projects to determine whether they will assist South Africa in achieving its sustainable development goals and to issue formal host country approval where appropriate. The DNA also provides support to project developers and facilitate promotion of South Africa as an attractive location for potential CDM investors.

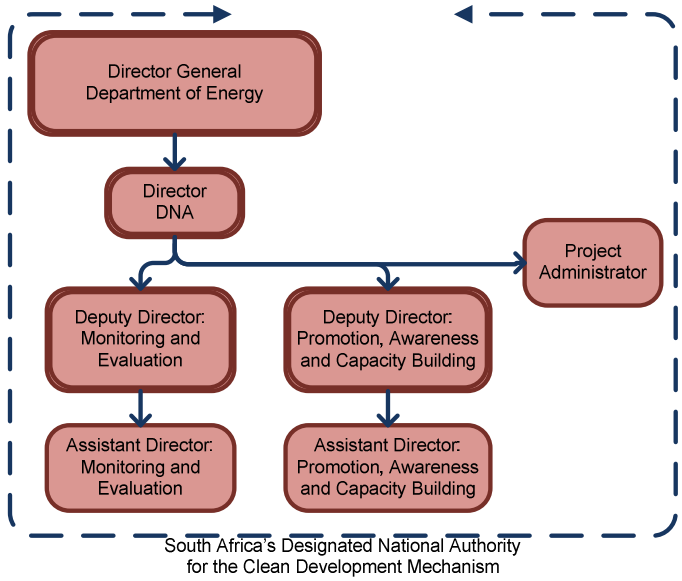


Figure 7.2 | South Africa's Designated National Authority (Source: Rambau, 2010)

The DNA has developed a set of sustainable development criteria to guide the approval process, as well as a procedure for evaluating a project's fulfilment of the defined sustainable development criteria.

7.4.2. SUSTAINABILITY CRITERIA

It is one of the core objectives of the CDM to contribute to the sustainable development of host countries. There are no common guidelines for sustainable criteria guidelines used by countries, but rather each had to develop its own. The criteria, based on social, economic and environmental considerations, should be in line with national development criteria (Brent *et al*, 2005:633).

South Africa defined sustainable development in the National Environmental Management Act (NEMA) (Act 107 of 1998) 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, 2008(b):1). Decisions by the DNA are informed by this definition.

The definition of sustainable development in NEMA introduces three core criteria used to assess the contribution of proposed projects. The core criteria are:

- *"Economic: Does the project contribute to national economic development?*
- *Social: Does the project contribute to social development in South Africa?*
- *Environment: Does the project conform to the National Environmental Management Act principles of sustainable development?"* (South Africa, 2008(b):1)

The principles of sustainable development in the Act requires *"the consideration of all relevant factors"* (South Africa, 2008(b):1), which includes:

- Avoiding, minimising or remedying the disturbance of ecosystems;
- Avoiding, minimising or remedying the degradation of the environment;
- Avoiding, minimising or remedying the disturbance of landscapes and sites that constitutes the nation's cultural heritage;

- Avoiding or if not possible to avoid, then minimising, reuse or recycle waste where possible, or otherwise dispose of in a responsible manner;
- Using and exploiting non-renewable resources responsibly and equitably, taking into consideration the consequences of the depletion of the resource;
- Developing, using and exploiting renewable resources and the ecosystems of which they are part, without exceeding the level beyond which their integrity is jeopardised;
- Applying a risk averse and cautious approach, taking the limits of current knowledge about the consequences of decisions and actions into consideration; and
- Anticipating and preventing, or minimising and remedying negative impacts on the environment and people's environmental rights.

The three core criteria are *"supported by additional indicators to allow the DNA to effectively regulate CDM project activity in South Africa"* (South Africa, 2008(b):1). These additional indicators are listed in Table 7.1.

Table 7.1 | Indicators in support of project approval criteria

Category		Indicator
Environmental	Impact on local environmental quality	• Impact of the project on air quality • Impact of the project on water pollution • Impact of the project on the generation or disposal of solid waste • Any other positive or negative environmental impacts of the project (such as impacts on noise, safety, visual impacts or traffic)
	Change in usage of natural resources	• Impact of the project on community access to natural resources • Impact of the project on the sustainability of use of

		water, minerals or other non-renewable natural resources • Impact of the project on the efficiency of resource utilisation
	Impacts on biodiversity and ecosystems	• Changes in local or regional biodiversity arising from the project
Economic	Economic impacts	• Impact of the project on foreign exchange requirements • Impact of the project on existing economic activity in the area • Impact of the project on the cost of energy • Impact of the project on foreign direct investment
	Appropriate technology transfer	• Positive or negative implications for the transfer of technology to South Africa arising from the project • Impacts of the project on local skills development • Demonstration and replication potential of the project
Social	Alignment with national, provincial and local development priorities	• How the project is aligned with provincial and national government objectives • How the project is aligned with local developmental objectives • Impact of the project on the provision of, or access to, basic services to the area • Impact of the project on the relocation of communities if applicable • Contribution of the project to any specific sectoral objectives (for example renewable energy targets

	Social equity and poverty alleviation	• Impact of the project on employment levels (specify the number of jobs created/lost; the duration of time employed, distribution of employment opportunities, types of employment, categories of employment changes in terms of skill levels and gender and racial equity) • Impact of the project on community social structures • Impact of the project on social heritage • Impact of the project on the provision of social amenities to the community in which the project is situated • Contribution of the project to the development of previously underdeveloped areas or specifically designated development nodes
General	General project acceptability	• Is the distribution of project benefits deemed to be reasonable and fair?

Source | South Africa, 2005:10-13

7.4.3. SOUTH AFRICA AS A CDM INVESTMENT DESTINATION

As an investment destination South Africa has some advantages over other non-Annex 1 countries. According to Ehlers and Wiekert (2006:1) these include *"favourable macroeconomic parameters, a 'mature' economy with a very advanced service and financial sector and infrastructure to OECD standards."* Some disadvantages Ehlers and Wiekert identified are the special requirements placed on business in terms of the rules on black economic empowerment, a shortage of qualified specialists and security concerns. Despite its strengths and potential, South Africa lags other major emerging markets in attracting foreign direct investment; during 2008 only managing to attract $9 billion and

during 2009 $5.7 billion – 0.83% and 0.96% respectively of total FDI for G-20 countries (Source: OECD, 2010:2).

In a study by Jung (2005) on country potential for the CDM, the results indicated that South Africa was a favourable CDM investment destination (see Addendum 6 for more details). Despite being rated *"very attractive"* (Jung, 2005:20), South African industry has been slow to use the CDM. *"This seems to be changing as the process becomes clearer and more streamlined and project costs are reduced"* (Gilder & Parramon, 2009:7). As table 7.2 and figure 7.3 indicate, the number of projects presented to the DNA shows a steady upward trend. A factor which may have contributed to this, is final clarity given by the Government on renewable energy feed-in tariffs, which created an incentive for investors to consider projects which previously may have been unprofitable.

Table 7.2 | Number of projects submitted to DNA per year

Year	Number of projects
2004	1
2005	8
2006	24
2007	21
2008	39
2009	36
2010[12]	42

Source | South Africa, 2010(a):unnumbered

[12] Till end of October 2010

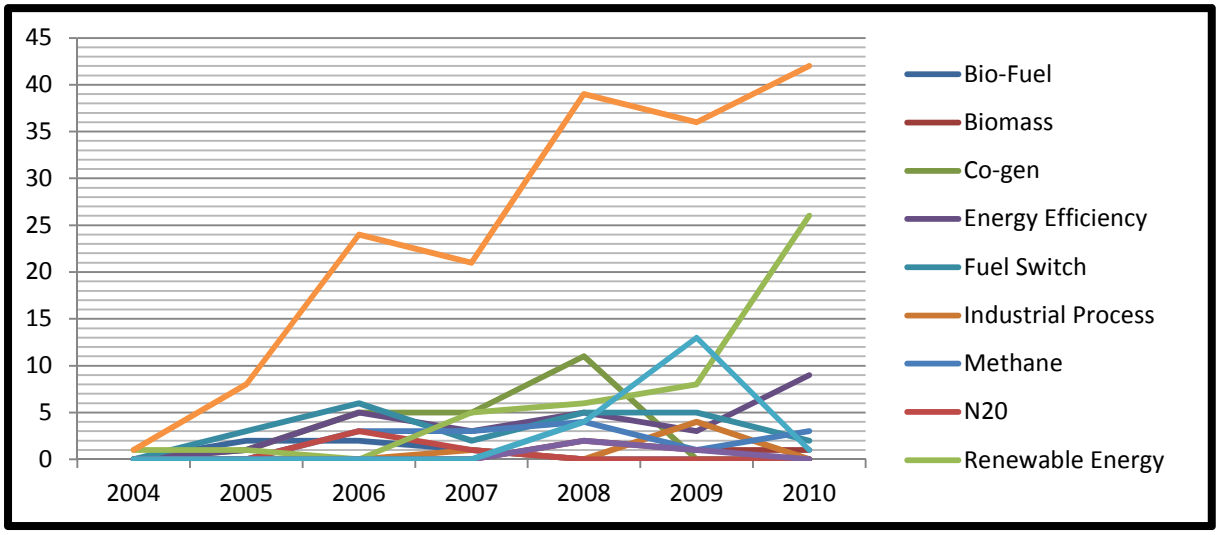


Figure 7.3 | Number of projects submitted to DNA: total and per project category (Source | South Africa, 2010(a):unnumbered)

Despite this, South Africa is not a *"major investment destination for the global carbon market, lagging many of its comparable non-Annex 1 counterparts involved in the CDM"* (Little, 2006:99). South Africa's 17 registered projects represents just 0.7% of the 2400 CDM projects registered with the CDM Executive Board, as of October 2010 (UNEP, 2010:11). When comparing CERs brought to market, South African exports of 1 023 000 CERs in 2009, represent just 0.3% of the global market of 333 069 100 CERs issued (Fay, Kapfudzaruwa & Na, 2010:5).

Realising the potential will depend on South African competitiveness in the CDM market including factors such as cost, *"institutional support and marketing of the country and its CDM options"* (Goldblatt, 2002:81). Little, Maxwell and Sutherland (2007:396-398) identified several facilitating and inhibiting factors influencing the growth and development of the CDM in South Africa. Among the facilitating factors are:

- the availability of finance for capital investments in projects that would not otherwise be considered if traditional channels of finance had to be used;
- the trade in CERs is seen as being economically profitable;
- technology transfer as one of the fundamental goals of the CDM; and

- the South African regulatory regime encouraging companies to implement measures to respond to climate change.

The most important factors inhibiting the growth and development of the CDM in South Africa include capacity constraints and local legislative requirements.

7.4.3.1. CAPACITY

'Capacity' and skills shortages has often been regarded as South Africa's greatest weakness inhibiting investment, growth and development (South Africa Info, 2009:unnumbered). The CDM process can be severely inhibited by a lack of sufficient capacity in all its various facets. Various United Nations agencies have been involved in building local capacity over the past few years. Starting off from a low base, the *"capacity among proponents of CDM in South Africa has grown considerably over the past two years"* (Little, 2006:26).

The capacity of the DNA to process project applications plays an important role in attracting investment and minimising investor risk perception. According to Silayan (2005:26) the performance of a country's DNA is indicated by the number of CDM projects it offers to the market. Ehlers and Wiekert (2006:3) described the South African DNA as a *"rather weak institution that evidently suffers from capacity problems. On the other hand, the person in charge of the authority ... gave unbureaucratic and speedy answers to enquiries made."* Evidently between 2006 and 2009, its capacity has been improved considerably since Fay *et al* (2009:12) reported that the South African DNA is *"well organised, effective and highly regarded"*, confirming impressions gained during interaction with staff from the DNA for the purpose of this study.

South Africa's DNA claims that project approval will be completed within a maximum of 45 days of receipt of the project design documentation. It further claims to have been able to keep to this period for all project applications for which it received complete documentation (Ehlers & Wiekert, 2006:3). In an interview with the DNA on 26 October 2010, Takalani Rambau (Deputy Director, Clean Development Mechanism) confirmed that the DNA managed to keep to this commitment.

A significant capacity constraint, not only reported in South Africa, relates to the designated operational entities. With only one DOE represented locally, it has the potential to present a considerable bottleneck in the project approval process.

7.4.3.2. LEGISLATIVE REQUIREMENTS

Local CDM projects must comply with domestic legal provisions and make a contribution to national and sustainable development objectives including job creation and poverty alleviation (Brent as cited in Walker, 2006:27). The DNA reports that it *"adopts a very flexible approach to the criteria. A project does not, it says, have to meet all requirements to obtain host country approval"* (Ehlers & Wiekert, 2006:3). However, according to Rambau (2010), any project that may lead to job losses will not be considered to meet the sustainability criteria, even if it would present significant environmental advantages.

Little (2006:104) found that "*ineffective government procedures hinder industrial CDM implementation and growth rather than facilitating the implementation of industrial CDM projects."* His study on what may be done to accelerate the implementation of the CDM in South African industry reported that *"two thirds of stakeholders mentioned the additional governmental requirements over and above the normal CDM project cycle. These include the need for environmental impact assessments (EIA)"* (Little, Maxwell & Sutherland, 2007:406).

The *Deutsche Investitions- und Entwicklungsgesellschaft mbH* (German Investment and Development Company – DEG) viewed the need for environmental impact assessments for certain projects as a major hurdle, since delays are *"possible in some provinces as the authorities in charge lack sufficient capacities to vet these"* (Ehlers & Wiekert, 2006:3). Since not only national government departments are involved in the process, but often approvals from provincial and local government structures are also required, it further complicates the process. *"If government could align these processes it would help to streamline the registration of more industrial CDM projects"* (Little, Maxwell & Sutherland, 2007:406).

CDM projects are *"capital intensive projects and starts off with negative income"* (Engineering News, 2008:1). *"To realize profit from the CDM and sell CERs to the open market, the investor must wait until the project delivers CERs. Technical knowledge and costs must be established before an investor can take ownership of the CERs... This is a risk for a party without substantial experience and knowledge of the market and industry, as most projects have no guarantee of funding, completion, and validation, with the result that CERs may not be created or registered"* (Tucker & Gore, 2008:3).

An important way to reduce costs is to *"minimize the time required for development and for obtaining necessary regulatory approvals. The need to undertake an environmental impact assessment (EIA) prior to project development is one aspect which may attract significant cost"* (Gilder & Basterfield, 2007:1). Costs include both direct costs (e.g. hiring an environmental assessment practitioner) and indirect costs (e.g. extended timeframes).

7.4.4. POTENTIAL SIZE OF THE SOUTH AFRICAN CDM MARKET

There is considerable variation in the estimates of the potential size of the South African CDM market. In the South African National Strategy Study on the Clean Development Mechanism of 2002 it was estimated that on the supply side *"between 20 and 25 $MtCO_2$ per year of emission reductions may be achievable at reasonable cost through already identified CDM options. About half of these reductions appear to be from projects that would be of interest to private sector investors"* (Goldblatt *et al*, 2002:80).

In Goldblatt's study, at the average predicted price for CERs of $11 per ton of CO_2e, the estimated amount of reductions of 10 to 12.5 $MtCO_2e$ for the private commercially viable projects alone, would translate into annual value of between $110 million (ZAR759 million[13]) and $137.5 million (ZAR 948.75 million).

[13] Exchange rate US$1 = ZAR6,9

When the demand side is considered, South Africa has the potential to satisfy demand for CERs of between 2.4 $MtCO_2e$ and 15.6 $MtCO_2e$, with an average predicted amount of 9 $MtCO_2e$ (Goldblatt, 2002:80). This would realise, at the average predicted price of $11 per tCO_2e, between $26.4 million and $171.6 million (ZAR182.16 million to ZAR1 184.04 million) per annum, or on average $99 million (ZAR683.1 million) per annum. Estimates for the potential demand was based on two assumptions:

- That South African CDM projects can at least match the costs of emission reductions of other CDM supplier countries; and
- That the country would be able to satisfy the same proportion of CDM investment demand as of other FDI.

The potential demand would roughly be in line with the estimated annual supply of commercially viable CERs. As a result of the limitations on the mitigation study reported by Goldblatt, which excluded the mining and industrial sectors, South Africa should be able to easily exceed the estimated supply.

Table 7.3 | 2002 Projected CER sales from South Africa

CDM volume	Price per ton ($ per annum)		
	$4	$11	$18
2.4 $mtCO_2e$	9 600 000	26 400 000	43 200 000
9 $mtCO_2e$	36 000 000	99 000 000	162 000 000
15.6 $mtCO_2e$	62 400 000	171 600 000	280 800 000

Source | Goldblatt, 2002:175

The South African DNA listed a CDM pipeline of 171 projects as of 28 October 2010 (see Addendum 7 for a complete list). Of these, 137 are Project Idea Notes (PINs) and 34 Project Design Documents (PDDs), 17 of which have been registered by the CDM Executive Board as CDM projects and 4 issued with CERs. Renewable energy (27.5% of pipeline), energy efficiency (15.2%) and fuel switching (13.45%) are the project categories with the largest number of projects. Energy efficiency

and fuel switching projects are responsible for the bulk of the projected emissions reductions, representing 66 $MtCO_2e$ or 66% of the total. Whereas in most other markets N_2O reduction and industrial process projects had the largest average emissions reductions per project, in South Africa fuel switching and energy efficiency projects has the largest average emissions reductions per project.

Table 7.4 | South Africa's CDM project portfolio by project type

Project Type	Number of Projects (registered) (submitted to DNA)	Estimated annual emissions reductions (tCO_2e)	Estimated average annual emissions reductions (tCO_2e per project)
Bio-fuel production	5 (0)(5)	958 000	191 600
Biomass	4 (0)(4)	204 482	51 120
Co-generation	22 (2)(20)	4 229 419	192 246
Energy efficiency	26 (2)(24)	34 899 953	1 342 305
Fuel switching	23 (3)(20)	31 525 500	1 370 674
Industrial process	5 (0)(5)	556 954	111 391
Methane recovery and flaring	14 (4)(10)	4 060 921	290 066
N_2O Reduction	4 (4)(0)	1 700 000	425 000
Renewable energy	47 (2)(45)	17 581 781	374 080
Transport	3 (0)(3)	2 172 148	724 049
Waste management	18 (0)(18)	2 347 473	130 415
Total	**171 (17)(154)**	**100 236 631**	**586 179**

Source | South Africa, 2010(a):unnumbered

Of the 171 projects in the South African CDM pipeline, 4 have been issued with CERs by the CDM Executive Board. This represents annual emissions reductions of 1 023 000 tCO_2e. The South African DNA reported a CER price range of €12 to €22 (or $16.8 to $30.8)[14] per tCO2e for South African assets (Rambau, 2010). Thus the projected annual income for projects issued with CERs should be between $17 186 00 and $31 508 400.

Table 7.5 | Projected revenue of CDM projects issued with CERs

CDM volume	Price per ton		
	$16.8 ZAR115.92	$23.8 ZAR164.22	$30.8 ZAR212.52
Annual	17 186 400	24 347 400	31 508 400
	118 586 160	167 997 060	217 407 960
Till end 2012	264 045 600	374 064 600	484 083 600
	1 821 914 640	2 581 045 740	3 340 176 840
Life of projects	322 828 800	457 340 800	591 852 800
	2 227 518 720	3 155 651 520	4 083 784 320

The 17 registered South African CDM projects projected an annual emissions reduction of 2.97 $MtCO_2e$ or taken over the life of the 17 projects a combined total of 38.601 $MtCO_2e$. Projected revenue from CER exports from these projects could be between US49 896 000 and $91 476 000 per year.

[14] Exchange rate €1 = US1.4

Table 7.6 | Projected revenue of registered CDM projects

CDM volume	Price per ton		
	$16.8 ZAR115.92	$23.8 ZAR164.22	$30.8 ZAR212.52
Annual	49 896 000	70 686 000	91 476 000
	344 282 400	487 733 400	631 184 400
Life of projects	648 496 800	918 703 800	1 188 910 800
	4 474 627 920	6 339 056 220	8 203 484 520

If all 171 projects in the South African CDM pipeline are considered, the total annual emissions reductions will amount to 100.24 $MtCO_2e$, which is substantially more than the 20 to 25 $MtCO_2e$ reported in the 2002 South African National Strategy Study on the Clean Development Mechanism (Goldblatt, 2002:80). Emissions over the life of these projects may amount to between 1, 711.8 $MtCO_2e$ and 1, 921.13 $MtCO_2e$. Projected revenue from CER exports could be between $1 683 975 401 and $ 3 087 288 235 per year.

Table 7.7 | Projected revenue of total CDM pipeline

CDM volume	Price per ton		
	$16.8 ZAR115.92	$23.8 ZAR164.22	$30.8 ZAR212.52
Annual	1 683 975 401	2 385 631 818	3 087 288 235
	11 619 430 266	16 460 859 543	21 302 288 820

Life of projects[15] (minimum timeframe)	28 757 816 438	40 740 239 954	52 722 663 470
	198 428 933 425	281 107 655 685	363 786 377 946
Life of projects (maximum timeframe)	32 274 935 330	45 722 825 051	59 170 714 772
	222 697 053 780	315 487 492 855	408 277 931 930

When comparing projected annual revenue for South Africa's 4 projects issued with CERs, with other South African exports, the export of CERs could constitute a small but significant part of total South African exports. Exports of between $17 million and $31 million of CERs would amount to between 0.03% and 0.05% of total South African exports of $58.3 billion[16] (Economist, 2010:215). If the 17 registered projects are considered, the percentage rises to 0.09% to 0.16%, and for the total pipeline it could amount to between 2.89% and 5.3%.

Table 7.8 | CER exports as a percentage of South African exports (2008 figures)

	CER exports	% of total exports (2008 = $58.3 billion)
Projects with CERs issued	$17 186 400	0.03%
	$24 347 400	0.04%
	$31 508 400	0.05%
Registered projects	$49 896 000	0.09%
	$70 686 000	0.12%
	$91 476 000	0.16%
CDM	$1 683 975 401	2.89%

[15] Some projects have the option of renewing for further periods. The minimum timeframe refers to the initial period, while the maximum timeframe includes all possible renewals.

[16] 2008 figures

pipeline	$2 385 631 818	4.09%
	$3 087 288 235	5.30%

7.5. CDM AND SOCIAL HOUSING

7.5.1. BACKGROUND

Housing has been at the top of the South African government's agenda since the start of the democratisation process in the early 1990s, and forms an important part of the country's attempts to alleviate poverty.

Section 26 (1) of the Constitution mentions access to adequate housing as a basic right for all South Africans, compelling the Government to take all *"reasonable measures within its available resources, to achieve the progressive realisation of this right"* (South Africa, 1996:1254).

The 1996 Census revealed a backlog of 2 202 519 houses (South Africa, 2010(c):unnumbered). Over the last 15 years, the government has managed to build 1, 4 million housing units (South Africa, 2010(c):unnumbered). This included 161 854 during the 2009/2010 financial year and 239 533 during the previous financial year (South Africa, 2010(b):unnumbered).

7.5.2. KUYASA CDM PROJECT

The project is located in Kuyasa, a neighbourhood in Khayelitsha, approximately thirty kilometres from the centre of Cape Town. Khayelitsha was established in the mid-1980s as a dormitory settlement to accommodate people migrating from the Eastern Cape to Cape Town in search of employment opportunities. It is an area with a complex social, economic and political history, with the majority of its residents trapped in chronic poverty. As part of the Government's scheme to relocate residents from informal to formal housing, low cost housing units have been constructed in Kuyasa using the

once-off Reconstruction and Development Programme (RDP) national housing subsidy. Each housing unit is thirty square metres (30 m^2) in area. Even though they are electrified they have neither ceilings nor water heaters, while lighting is provided employing incandescent light bulbs. According to SouthSouthNorth (2005(b):2) *"energy service bench marks such as thermal comfort and warm water on demand are not met. The energy profile of the resident of Kuyasa is characterised by multiple fuel use (e.g. paraffin, wood) for space and water heating."*

The project is a partnership between the City of Cape Town, SouthSouthNorth (an NGO) and the community of Kuyasa. On conclusion of a three year process of project design in partnership with SouthSouthNorth and the local beneficiary community, the City of Cape Town, as project owner, registered Kuyasa as a CDM Project with the CDM Executive Board in August 2005.

7.5.2.1. PROJECT DESCRIPTION

"Certified by the CDM Executive Board on 27 August 2005, Kuyasa is the first Gold Standard project in the world to generate certified emissions reductions credits and has been widely applauded both nationally and internationally" (Bond, 2007:74).

The 'Kuyasa low-cost urban housing energy upgrade project' (the project) *"demonstrates sustainable energy interventions as being appropriate and effective in meeting the energy service needs of low-income communities"* (SouthSouthNorth, 2005(a):1). It also demonstrates how a mechanism like the Clean Development Mechanism (CDM) can be linked to poverty alleviation and sustainable development.

Project planning started in 2002. The pilot phase, launched in July 2003, involved 8 homes and 2 crèches. Phase II expanded the target group from 10 to 2 309 units throughout Kuyasa. The project involves retrofitting the low-cost housing units with solar water heaters, ceilings and ceiling insulation, as well as replacing the existing incandescent light bulbs with compact fluorescent lights. Two thousand three hundred existing low-income houses in Kuyasa, Khayelitsha were identified and selected for inclusion in the project, which produced significant savings in future CO_2 emissions

calculated over a period of 21 years, by reducing the reliance on fossil fuels both directly and indirectly.

"A world first in the Kuyasa project is that the CDM methodology being applied interprets the rules compiled through the UNFCCC in a manner which allows for the crediting of greenhouse gas reductions against a baseline that is equivalent to a projected level of energy service (a warm house, sufficient warm water and light) rather than the current level of energy poverty, characterised by 'suppressed demand' for energy services. Rather than waiting for these households to become 'dirty' as a result of increased energy consumption before they qualify to get 'clean', they are 'leap-frogged' to the cleaner technologies through the CDM mechanism, thus linking climate change to poverty alleviation" (SouthSouthNorth, 2005(b):3). The project developer calculated that in total 2.85 tonnes of CO_2 emissions are saved per household per year as a result of the project. Over the life of the project of 21 years, emissions of 138,180 tCO_2e will be prevented.

In addition to the physical needs that are satisfied through infrastructure upgrading, the project involves other sustainable development benefits. The City of Cape Town, the project owner, lists the following:

- *"A saving in the cost of energy services to households by approximately $100 per household per year.*
- *Health cost benefits due to increases in the ambient temperature and reduced reliance on heat sources holding fire-related dangers and negative respiratory health impacts (~800 000 hospitalisation incidents related to fire and ingestion of paraffin).*
- *Employment creation of approximately 100 person years for installation of technologies and associated infrastructure (this is not inclusive of the local manufacture of the technologies, which would add to this figure).*
- *Potential for replication across all low-income housing in South Africa.*
- *The Net Present Value of the income from the emissions reductions will cover ~30% to 40% of the capital costs of the installation of these technologies, based on the current nature of the carbon market.*

- *Building human capacity around various aspects of the project design, most notably around energy efficiency and renewable energy and the development of a social awareness and an understanding of the link between the environment and energy consumption, by drawing marginalised people into a global environmental issue"* (Cape Town, 2009:unnumbered).

SouthSouthNorth (2005(b):3) reported a strong emphasis on community engagement throughout the process. The municipal ward development forum formed a broad-based steering committee involving community members in project design. In addition the steering committee is responsible for:

- beneficiary selection;
- mapping out the project through its different phases; and
- facilitating contact and a flow of ideas between the community and the project developers.

Design and technical problems were communicated through regular meetings by the community based steering committee. As a result the project is actively supported by local residents and scored a particularly high Gold Standard rating in terms of social sustainability and local development.

The project created local jobs in installing and maintaining the locally manufactured solar water heaters. Furthermore, the ZAR685.00 average annual savings on electricity expenses is retained in the local economy with the resultant possibility of further economic spin-offs.

7.5.2.3. PROJECT FINANCE

An analysis of project cost versus projected revenue over the life of the project shows a net profit of $983,634.00, as indicated in table 7.9.

Table 7.9 | Balance sheet of Kuyasa CDM project

Upfront Cost	
Per house	$771.00

Number of houses	2,309
Total	$1,780,239.00
Revenue	
Emissions reduction per household (tCO_2/hh/year)	2.85
Credit price	$20.00
Revenue per household	$57.00
Number of households	2,309
Revenue per year	$131,613.00
Revenue over project lifespan	$2,763,873.00
Net Profit	$983,634.00

Source | Manning, 2008:11

On completion of the pilot phase, the project team had to secure the necessary finance for full project implementation. Upfront costs included capital costs, labour, ongoing maintenance, project management, as well as the CDM transaction costs. This equated to $771.00 per house.

Sources of revenue for the project were limited. Beneficiaries could only contribute an estimated 15% of the project costs, based on their historical energy expenditure. The sale of CERs – the carbon income – added up to a further estimated 15 to 20% of the project's financing needs. As a result a significant amount of grant finance was required to close the gap between revenues and costs. Grant funding from the South African Government as well as the Western Cape Provincial Government, plugged the gap. *"These sources of funding are generally once off grants and are thus not considered to be sustainable, as they cannot be counted on for other similar projects in the future. At the current price of carbon, carbon revenues are insufficient to fulfil the project's financing needs. As a result there is a need for a financial model to enable replication of the project in other areas of South Africa. Access to sustainable financing is central to the replicability of the project"* (SouthSouthNorth, 2005(b):4). *"With the vast majority of funding for this project now secured through the government,*

SouthSouthNorth is now referring to the project as 'a public sector project, relying on government grant funding for its implementation'" (Bond, 2007:95).

7.5.3. CDM SOCIAL HOUSING PROGRAMME

The Kuyasa CDM project was developed with the intention to serve as a model for similar projects involving South Africa's low cost housing stock. Unfortunately this has not yet materialised. A main reason for this is the complete absence of the Government (other than some municipalities) in CDM project development, despite the fact that Government is South Africa's largest property owner and initiator of new property developments through its social housing delivery strategy. There is no apparent good reason for this absence. The DNA reported that despite their best efforts to market the advantages of the CDM to Government, no progress can be reported (Rambau, 2010).

When social housing is considered, the Kuyasa CDM project should point the way forward. If the project design for Kuyasa is taken as model, and is replicated to the 1.4 million low cost houses Government has delivered over the last 15 years, the potential income to supplement Government's budget for housing delivery of ZAR13 033 695 000 in 2009/2010 (South Africa, 2010(b):22) can be significant.

If a projection is done using the amount of emissions savings calculated for the Kuyasa CDM project as a baseline, a CDM programme involving Government's current stock of social housing may yield 3.9 $MtCO_2e$ per year. Over the life of the programme of 21 years, it may save 83.7 $MtCO_2e$. Potential revenue from the export of CERs may yield between $67 million and $122 million per year, or $1.4 billion (ZAR9.66 billion) to $2.5 billion (ZAR17.25 billion) over 21 years.

Table 7.10 | Projected revenue for a Social Housing CDM Programme

Social Housing CDM Programme				
Period	CDM Volume (tCO2e)	Price per ton ($)		
		16.8	23.8	30.8
Annum	3 990 000	67 032 000	94 962 000	122 892 000
Period	83 790 000	1 407 672 000	1 994 202 000	2 580 732 000
Period	CDM Volume (tCO2e)	Price per ton (ZAR)		
		115.92	164.22	212.52
Annum	3 990 000	462 520 800	655 237 800	847 954 800
Period	83 790 000	9 712 936 800	13 759 993 800	17 807 050 800

If expenditure on the Kuyasa project is used as a guideline, the balance sheet for a potential social housing CDM programme may be decidedly positive. Admittedly the balance sheet calculation is optimistic since it is based on data for costs per housing unit dating from 2005. Despite this, the calculation is still useful as an indicator of the potential of such a programme.

Table 7.11 | Balance sheet of a Social Housing CDM programme

Upfront Cost	
Per house	$771.00
Number of houses	1.4 million
Total	$1 079 400 000
Revenue	
Emissions reduction per household (tCO_2/hh/year)	2.85

Credit price	$16.80 to $30.80
Revenue per household	$47.88 to $87.78
Number of households	1.4 million
Revenue per year	$67 million to $122 million
Revenue over project lifespan	$1 407 672 000 to $2 580 732 000
Net Profit	$328 272 000 to $1 501 332 000

Over and above the financial returns on the investment, the social returns in terms of improved quality of life will make a significant contribution to the sustainability of South Africa's poor communities.

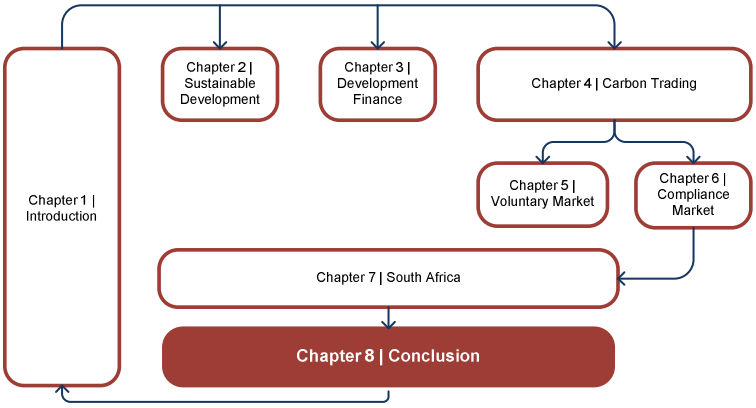
7.6. CONCLUSION

South Africa ratified the Kyoto Protocol in 2002, thus enabling it to participate in Clean Development Mechanism project development as a non-Annex 1 Party with no binding emission reduction targets for the first commitment period between 2008 and 2012. South Africa is one of the largest emitters of greenhouse gasses globally relative to the size of its population and economy. This combined with its sophisticated business environment, means that the country should be a significant CDM role-player.

For a variety of reasons it is not yet, although the number of CDM projects in its pipeline is steadily increasing. Important contributing factors to the slow start may be the initial capacity constraints at the DNA and the numerous delays in finalising the regulatory environment for renewable energy, at long last creating an incentive for investors to consider projects which previously may have been unprofitable.

The 171 projects currently in the South African CDM pipeline should result in annual emissions reductions of 100.24 $MtCO_2e$ or emissions savings over the life of these projects of between 1 711.8 $MtCO_2e$ and 1 921.13 $MtCO_2e$. Projected revenue from CER exports could be between $1.6 billion and $ 3 billion per year or between $32 billion and $59 billion over the period.

A significant opportunity Government has been slow to capitalise on, is the country's low cost housing stock of 1.4 million units. Based on the experience of the Kuyasa CDM project, Government could earn revenues of between $67 million and $122 million per year, or $1.4 billion to $2.5 billion over 21 years, while significantly improving the quality of life of its poorest citizens.



8.1. AIM OF THE RESEARCH

In the renewed focus on poverty alleviation in the international development arena, there has been an emphasis on development assistance from rich donor countries to poor developing countries. This however may not be a reliable or adequate source of development finance.

In the context of sustainable development, poor countries will not be the only ones requiring development finance. It is clear that rich countries need to undergo a process of 'redevelopment' to adjust to a more sustainable development trajectory. This will place unprecedented demands on the international financial system, which is still in the process of recovering after the recent financial crisis. It may therefore be necessary to look at alternative sources of development finance. There are some interesting proposals around. One alternative, which has received a lot of attention lately, is carbon finance and the possible contribution thereof to sustainable development.

This paper sought to examine alternative sources of finance for sustainable development in South Africa. It specifically investigates carbon trading, as an alternative, market-based mechanism to raise development finance, while making direct positive contributions to sustainability.

In this research an exploratory research methodology reviewing the existing literature appropriate to the topic was used. In this way the 5 questions guiding the research has been answered.

8.2. SUMMARY OF FINDINGS

1) WHAT CONSTITUTES THE MORE TRADITIONAL SOURCES OF DEVELOPMENT FINANCE FOR DEVELOPING COUNTRIES?

Traditional sources of development finance for poor countries include official development aid, foreign direct investment, private companies and foundations, remittances, and specialist funds like the Global Fund to Fight AIDS, Tuberculosis and Malaria, the GAVI Alliance and the GEF.

ODA has historically been the main source of investment. Despite the fact that ODA are at historically high levels, FDI is currently the most important source of development finance. There is fierce competition to attract export-oriented FDI. Africa seems to be more successful at attracting extractive and market seeking FDI, which does not necessarily contribute to sustainable development.

2) WHAT ARE SOME ALTERNATIVE SOURCES OF DEVELOPMENT FINANCE?

Many interesting ideas have been raised over the last few years to raise alternative sources of development finance. The most significant of these will be to reduce damaging flows such as subsidies and debt repayments. Although much progress have been made on international debt repayments, any reductions of national subsidies seem politically impossible.

On the other hand there are some interesting ideas on how to create positive flows. These include global taxes on currency transactions and arms sales, as well as global environmental taxes. Some other ideas are the creation of a global lottery, global premium bonds, an International Finance

Facility, the issuing of Special Drawing Rights for public goods, public guarantees and payment for environmental services.

3) HOW MUCH SUSTAINABLE DEVELOPMENT CAN BE EXPECTED FROM CLEAN DEVELOPMENT MECHANISM PROJECTS?

The CDM is a flexibility mechanism of the Kyoto Protocol intended to assist countries to meet their commitments to stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropocentric interference with the climate system. In addition it was intended to assist developing countries with their sustainable development. CDM's success at contributing to sustainable development has been severely criticised. Yet in the absence of agreement on exactly what needs to be achieved, the debate is somewhat complicated.

The concept of sustainable development refers to both needs and limits; needs encompass the obligation to address global poverty through the various approaches that has emerged over the years. Environmental limits impacts on the process of addressing needs. The most serious dimension of environmental limits must be global climate disruption resulting from increased greenhouse gas concentration in the atmosphere from human activity. Global climate change will affect the poor first and also most severely.

If development is seen as a process whereby income poverty is addressed, the criticism levelled against the CDM on sustainable development is most probably fair. Few CDM project types will have a direct monetary benefit to the poor, although some will improve the quality of life of the poor. These must be promoted and implemented since carbon finance offers an opportunity as an alternative source of development finance. Yet the most important contribution the CDM will make to sustainable development, is by contributing to a reduction in greenhouse gas emissions and helping emerging economies onto a more sustainable development trajectory, ultimately securing the livelihoods of the poor.

4) WHAT IS THE SCALE OF POTENTIAL INCOME FROM THE CLEAN DEVELOPMENT MECHANISM FOR SOUTH AFRICA?

South Africa is not a major investment destination in the CDM market. South Africa's 17 registered CDM projects represent just 0.7% of all registered CDM projects. Recently the DNA has received more project ideas, with a total of 171 projects in the CDM pipeline.

Projected revenue from the CDM pipeline is between $1.6 billion and $3 billion per year, or taken over the lifetime of the projects between $28.7 billion and $59 billion (in constant 2010 dollars).

5) WHAT CAN THE SOUTH AFRICAN GOVERNMENT DO TO LEVERAGE THE CLEAN DEVELOPMENT MECHANISM TO BENEFIT THE POOR?

The South Africa Government has played no role in CDM project development, even though as the country's largest property owner it should have enormous opportunities in energy efficiency projects. One way in which the Government can leverage the CDM, while delivering direct benefits to the quality of life of the poor, is by replicating the model offered by the Kuyasa CDM project. The country's stock of 1.4 million social housing units constructed over the last fifteen years can be retrofitted with solar water heaters, energy efficient lighting systems and proper insulation to improve the thermal properties thereof.

Direct benefits to the poor include job opportunities during the manufacturing and construction phases, improved health resulting from improved quality of housing stock and savings on energy expenses. The programme will also generate substantial amounts of carbon finance. An estimation using the parameters of the Kuyasa CDM project, indicates that Government may have a net profit of between $328 million and $1.5 billion on the sale of CERs.

8.3. CONCLUSION AND RECOMMENDATIONS

The exploratory nature of this study, and the fact that precedent studies do not exist, exposed gaps and uncertainties as well as opportunities for future research. The study specifically indicated that:

- Carbon trading through the regulated market does present a viable option as an alternative source of development finance;
- Carbon finance must be seen as part of a 'mix' of finance options; and
- Carbon finance can make a significant contribution to financing sustainable development.

Further empirical research is required to substantiate the findings of this study. Therefore the following research is recommended:

- More in-depth case studies should be done of the projects in the South African CDM pipeline at the different stages of development (PIN approved, PDD approved, Registered and CERs issued). This could substantiate for example if the findings on revenue potential done in this study, which is based on a CER price band and projected emissions reductions, is in fact accurate.
- More in depth research on the potential for CDM projects in South Africa and specifically what should be the national priorities on emissions reductions.
- In depth research on the size, scope and potential for projects linked to the voluntary carbon market.

These research projects would require substantial resources - especially dedicated researcher time - thus they could not be included in this study.

Based on the results of this study, it is recommended that South Africa needs to have a much more focused approach to realising its potential for emissions reductions and by consequence earning revenue from the export of carbon credits. Government especially needs to play a proactive role in identifying and developing projects where it has a direct interest, as illustrated in the case of the country's social housing stock. As the DNA is responsible for evaluating and approving proposed CDM projects, it cannot take on this responsibility since it would create a conflict of interest. It is

therefore recommended that an agency like the Central Energy Fund (CEF) is tasked to this end. The CEF is already an active player in the CDM market, assisting several South African municipalities as a CDM project developer. Their current role could quite easily be expanded to include a wider focus, assisting the country to move onto a more sustainable development trajectory.

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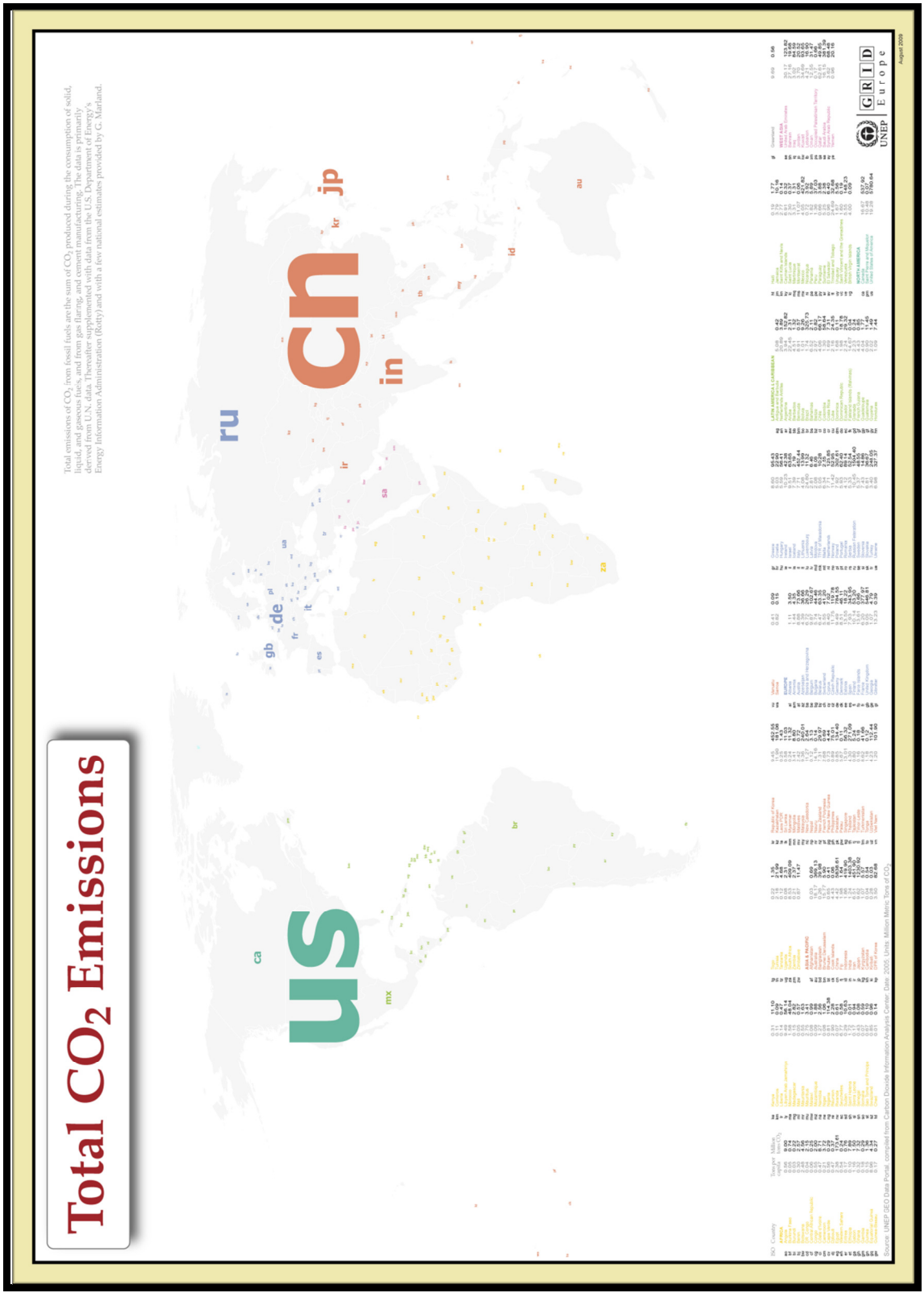
ADDENDA

1. Global CO_2 emissions
2. Common types of offset projects
3. Verification standards used in the voluntary market
4. Certification standards used in the voluntary market
5. Annex 1 Parties to the Kyoto Protocol
6. Host country ranking
7. South Africa's CDM project portfolio
8. CER exports per project category



Source | UNEP, 2009:unnumbered

Project Type	Advantages	Disadvantages
Methane Capture and Destruction from Landfills	• Efficient means of reducing emissions • Captured gas useful as fuel • Somewhat reduced odours • Reduced risk of ground water contamination • Relatively inexpensive • Easy to measure and monitor	• Potential project based concerns about complete additionality
Methane Capture and Destruction from Livestock	• Efficient means of reducing emissions • Captured gas useful as fuel • Reduced odours and co-pollutants • Reduced risk of ground water contamination • Relatively inexpensive	• Concerns about complete, project-based additionality
Methane Capture and Destruction from Coal Mines	• Efficient means of reducing emissions • Captured gas useful as fuel • Few leakage concerns • Can improve safety for mine workers • Relatively inexpensive	• Concerns about complete, project-based additionality in active mines

Industrial Gas Destruction	• Very efficient • Highly additional • Relatively inexpensive • Easy to reliably measure and monitor	• Potential supply is limited • May not provide the marketing benefits of other offset forms
Direct Fossil Fuel Reduction	• Supports clean technology • Cost savings • Reduces co-pollutants such as SO_x, PM and VOCs • Reduces fossil fuel dependency • Potential social benefits	• Relatively inefficient means of reducing GHGs
Indirect Fossil Fuel Reduction (RECs)	• Established market (in US) with certification and verification systems • Supporting on-grid renewable energy important for decreasing reliance on fossil fuels • Reduces co-pollutants such as SO_x, PM and VOCs	• Compatibility issues between markets for RECs and carbon offsets (i.e. double counting of reductions)
Reforestation-Afforestation of Native Tree Species	• Large number of potential social co-benefits • Contributes to biodiversity conservation • Addresses deforestation, an important part of the climate	• Lack of permanence • Uncertain science for quantifying reductions • Relatively inefficient means of reducing GHGs • Less efficient than many mono-crop projects

	change problem • High potential marketing value	• Relatively expensive
Avoided Deforestation of Native Trees	• Large number of potential social co-benefits • Contributes to biodiversity conservation • Addresses deforestation, an important part of the climate change problem • Potentially less expensive than reforestation • High potential marketing value	• Lack of permanence • Relatively inefficient means of reducing GHGs • Major concerns about leakage (i.e. protecting forests in one area shifts deforestation elsewhere) • Difficult to measure additionality • No accepted methodology under CDM
Reforestation-Afforestation Monoculture	• Some potential for social co-benefits • Trees with high sequestration rates can be selected • Often lower cost	• Lack of permanence • Relatively inefficient means of reducing GHGs • Concerns about water consumption • Reduced social and environmental co-benefits compared to projects that use native tree species • Can backfire in marketing terms
Soil Sequestration	• Reduced erosion • Large number of potential	• Questions of additionality and permanence should be

	social co-benefits • Improved water quality • Relatively inexpensive	carefully considered • Science unclear on measuring and quantifying reductions
Geological Sequestration	• Huge potential for storage	• Few co-benefits • Technology still evolving • Long term risks • Effectiveness uncertain

Source | Adapted from Hamilton *et al*, 2006:8-9

	Gold Standard	Voluntary Carbon Standard	Climate Neutral Network	Green-e	Climate, Community, Biodiversity Standard	Chicago Climate Exchange	ISO 14064
Additionality Tests				X	X		X
Environmental & Social Co-Benefits	X		X		X		
Requires Monitoring	X	X	X	X	X	X	X
Reporting/ Registration	X	X		X		X	X
Uses WRI/WBCSD GHG Protocol		X	X			X	X
Certification outside US	X	X	X	X	X	X	X
Compatible with other standards	X	X	X	X	X	X	X
Sequestration Projects		X	X		X	X	X

Off-Grid Renewable	X	X	X			X	X
Energy Efficiency	X	X	X			X	X
Methane	X	X	X			X	X
Renewable Energy Credits			X	X			X

Source | Hamilton *et al*, 2006:11

ADDENDUM 4 | CERTIFICATION STANDARDS USED IN THE VOLUNTARY MARKET

	Description	Environmental & Social Benefits?	Reporting/ Registration	Certification Logo?	Include LULUCF?	Geographical Reach	Start Date
Gold Standard	Certification for offset projects & carbon credits	Yes	VER Registry in development	Yes	RE & EE projects	International	2006
The VCS	Certification for offset projects & carbon credits	No	Use Bank of New York; other registry TBD	Yes	Yes	International	Mid-2007
Green-e	Certification for offset sellers	No	Registry incorporated	Yes	Accepts other standards that include LULUCF	North America; international possibilities	Mid-2007
CCB Standards	Certification programme for offset projects	Yes	Projects on website	Yes	Only LULUCF	International	2007
CCX	Internal system for CCX offset projects & carbon credits	No	Registry incorporated with trading platform	No	Yes	International	2003
Plan Vivo	Guidelines for offset projects	Yes	No	No	Community based agro-forestry	International	2000
Climate Neutral Network	Certification programme for offset sellers & carbon neutral	No	No	Yes	Yes	Primarily North America	2001

	products						
Greenhouse Friendly	Certification programme for offset sellers & carbon neutral products	No	No	Yes	Yes	Australia	2001
WBCSD/WRI Protocol	A set of guidelines for projects & corporate GHG accounting	No	Does not include registry	No	Protocol created for LULUCF	International	2001
CCAR	A registry protocol	No	Reporting protocols used as standards	No	Yes, first protocol	Currently California	2005
VER+	Certification programme for offset projects, carbon credits & carbon neutral products	No	TÜV SÜV BlueRegistry	Yes	Includes JI or CDM methodologies	International	Mid-2007
ISO 14064	Certification programme emissions reporting offset projects, carbon credits	No	No	No	Yes	International	Methodology released in 2006
VOS	Certification for offset projects & carbon credits	No	TBD	NO	Follow CDM or JI methodologies	International	TBD
Social	Certification for	Yes	Creating its own	Yes	Reforestatio	South America &	2002

Carbon	offset projects & carbon credits		registry system Yes		n & avoided forestation	Portugal	
DEFRA	Proposed consumer code for offsetting & accounting	No	Does not include registry	No	Follow CDM/JI standards	UK	TBD

Source | adapted from Hamilton *et al*, 2007:43

European Union (15 Member States)			Economies in Transition			Other Parties		
Party	Target	Emission in 1990	Party	Target	Emission in 1990	Party	Target	Emission in 1990
Portugal	27%	59.3	Russia	0%	3,046.6	Iceland	10%	3.3
Greece	25%	109.4	Ukraine	0%	978.9	Australia	8%	417.9
Spain	15%	283.9	Croatia	-5%	31.8	Norway	1%	50.1
Ireland	13%	53.8	Poland	-6%	564.4	New Zealand	0%	61.5
Sweden	4%	72.2	Romania	-8%	265.1	Canada	-6%	595.9
Finland	0%	70.4	Czech Republic	-8%	192	Japan	-6%	1,187.2
France	0%	568.0	Bulgaria	-8%	138.4	USA	-7%	6,082.5
Netherlands	-6%	211.7	Hungary	-6%	122.2	Switzerland	-8%	52.4
Italy	-6.5%	511.2	Slovakia	-8%	72.1	Liechtenstein	-8%	0.3
Belgium	-7.5%	145.7	Lithuania	-8%	50.9	Monaco	-8%	0.1
UK	-12.5%	748	Estonia	-8%	43.5	Turkey		
Austria	-13%	78.6	Latvia	-8%	25.4			
Denmark	-21%	70.7	Slovenia	-8%	20.2			
Germany	-21%	1,243.7	Belarus	-8%	129.2			
Luxembourg	-28%	13.4						
EU 15	-8%	4,240						

Sources | United Nations, 1998:23; and CantorCO_2e:2010:unnumbered

ADDENDUM 6 | HOST COUNTRY RANKING

Host country classification on attractiveness for CDM project investments:

Very Attractive	Attractive	Somewhat Attractive	Limited Attractiveness	Very Limited Attractiveness	Very Unattractive
Argentina	Antigua & Belize	Bolivia	Azerbaijan	Uzbekistan	Algeria
Brazil	Chile	Egypt	Armenia		Albania
India	Costa Rica	Israel	Bangladesh		Bahrain
Mexico	El Salvador	Jamaica	Sri Lanka		Botswana
South Africa	Jordan	Morocco	Colombia		Bahamas
Thailand	Mongolia	Philippines	Cuba		Bosnia & Herzegovina
China	Mauritius	Vietnam	Ecuador		Benin
Indonesia	Maldives		Equatorial Guinea		Brunei
	Malaysia		Georgia		Chad
	Panama		Guatemala		Congo (Brazzaville)
	Trinidad & Tobago		Honduras		Congo, Democratic Republic of
	Uruguay		Laos		Cameroon
			Madagascar		Central African Republic
			Moldova		Cape Verde
			Mali		Dominican Republic
			Niger		Ethiopia
			Nicaragua		Gambia
			Paraguay		Gabon

			Peru		Ghana
			Uganda		Guinea
			Yemen		Guyana
			Zimbabwe		Haiti
					Iran
					Ivory Coast
					Iraq
					Kenya
					Kyrgyzstan
					North Korea
					Kuwait
					Kazakhstan
					Lebanon
					Liberia
					Lesotho
					Libya
					Malawi
					Macedonia
					Mauritania
					Oman
					Mozambique
					Nigeria
					Nepal
					Suriname
					Pakistan
					Papua New Guinea
					Guinea-Bissau
					Qatar
					Rwanda
					Saudi Arabia

					Seychelles
					Senegal
					Sierra Leone
					Sudan
					Syria
					United Arab Emirates
					Tajikistan
					Togo
					Sao Tome & Principe
					Tunisia
					Turkmenistan
					Tanzania
					Burkina Faso
					Venezuela
					Zambia

Source | Jung, 2005:22

Up to 28 October 2010, 171 CDM projects have been submitted to the DNA – 137 Project Idea Notes (PINs) and 34 Project Design Documents (PDDs). Of the 34 PDDs, 17 have been registered by the CDM Executive Board as CDM projects, and 4 issued with CERs. The other 17 are at different stages in the project cycle. The table below is a consolidated list of registered projects (dark shaded background), projects at PDD (light shaded background) and PIN stages.

No	Date submitted to DNA (day/month/year)	Project Title	Project Description	Project Type	Annual Emission Reduction (tCO_2e)	Project Life-span	Project Status	Project Developer/Owner
1	10/2005	Kuyasa Low-Cost Urban Housing Energy Project	Installation of solar water heaters, ceiling insulation and compact fluorescent lights in RDP houses	Energy efficiency	7,000	21	• Registered on 27 August 2005 • Gold Standard verification • Implementation underway	City of Cape Town
2	11/10/ 2005	Bethlehem Hydro	Construction of hydro power plant	Renewable energy	27,000	20	• Registered on 8 October 2009	NuPlanet BV
3	11/10/2005	Rosslyn Brewery Fuel-Switch Project	Replace coal with natural- and biogas as energy source	Fuel switch	107,000	7	• Registered on 29 November 2006 • Implementation underway	South African Breweries

4	10/10/2005	Lawley Fuel Switch Project	Replace coal with natural gas as thermal fuel	Fuel switch	19,000	10	• Registered on 6 March 2006 • Implementation started 2006 • **CERs issued 06/2008**	Corobrick
5	22/12/2005	PetroSA Biogas-to-energy Project	Use waste gas presently flared to generate electricity	Co-generation	29,000	10	• Registered on 29 September 2006 • Implementation underway	MethCap (Pty) Ltd
6	6/02/2006	Emfuleni Power Project	Capture and use off-gasses to generate electricity	Co-generation	608,000	10	• Project is at validation stage • Project approval	EcoElectrica (Pty) Ltd
7	25/04/2006	Durban Landfill-gas-to-electricity project – Marrianhill & La Mercy Landfills	Recover landfill methane for electricity generation	Methane recovery and flaring	69,000	7	• Registered on 15 December 2006 • Construction started in 2006 • Project operational • First verification done	Ethekwini Municipality
8	26/07/2006	Omnia Fertilizer Ltd Nitrous Oxide Reduction Project	Reduce emissions of Nitrous Oxide from Nitric Acid production	N_2O Reduction	576,000	21	• Registered on 3 May 2007 • Implementation begun • **CERs issued 01/2009**	Omnia Fertilizer Ltd
9	18/07/2006	Tugela CFB10 Conversion of Coal to Bark Fired	Replace coal with biomass as fuel input at Tugela Pulp and Paper Mill	Fuel switch	70,000	7	• Registered on 12 February 2007 • Construction started January 2007	Sappi Kraft Ltd

10	28/08/2006	Mondi Richards Bay Biomass Project	Generate electricity from biomass	Co-generation	222,000	10	• Registered on 20 May 2007 • Implementation has begun	Mondi Business Paper
11	18/08/2006	Mondi Richards Bay Gas Turbine Co-generation Project	Switch fuel from coal and grid electricity to natural gas	Fuel switch	131,000	20	• At validation stage • DNA approval	Mondi Business Paper
12	06/11/2006	Transalloys Manganese Alloy Smelter Energy Efficiency Project	Reduce the electricity consumption in the production of silicon manganese alloy (SiMn)	Energy efficiency	83,000	10	• Registered on 19 October 2007 • **CERs issued 11/2008**	Ecosecurities South Africa (Pty) Ltd
13	06/11/2006	Sasol Nitrous Oxide Abatement Project	Reduce the Nitrous Oxide emission from the nitric acid plants of the Sasol Nitro operations	N_2O Reduction	610,000	10	• Registered on 25 May 2007 • Implementation begun • **CERs issued 08/2008**	Sasol Nitro Division
14	20/11/2006	EnviroServe Chloorkop Landfill Gas Recovery Project	Recover and use methane gas from EnviroServ Chloorkop landfill	Methane recovery and flaring	188,000	7	• Registered on 27 April 2007 • Commissioned 01/2008 • Operational agreement finalised	EnviroServe Waste Management (Pty) Ltd
15	04/12/2006	Nitrous Oxide Emission Reduction Project – Plant 9	Reduce N_2O emissions during production of nitric	N_2O Reduction	250,000	10	• Registered on 5 November 2007 • Implementation underway	African Explosives Ltd. South Africa

			acid (HNO_3)					
16	09/05/2007	Nitrous Oxide Emission Reduction Project – Plant 11	Reduce N_2O emissions during production of nitric acid (HNO_3)	N_2O Reduction	264,000	10	• Registered on 8 February 2008	African Explosives Ltd. South Africa
17	31/07/2007	Kanhym Farm Manure to Energy Project	Generate electricity from anaerobic digestion of piggery manure	Renewable energy	27,000	10	• Registered on 18 July 2008	BioTherm SPV1 (Pty) Ltd
18	28/09/2007	Humphries Boerdery Piggery Methane Capture and Electricity Generation Project	Generate electricity from anaerobic digestion of piggery manure	Renewable energy	11,000	20	• Approved by DNA • Pending approval by the CDM EB	Humphries Boerdery (Pty) Ltd
19	18/09/2007	Durban Landfill Gas to Electricity Project – Bisasar Road Landfill	Recover landfill methane for electricity generation	Methane recovery and flaring	352,000	20	• Registered on 26 March 2009	Ethekwini Municipality
20	31/03/2008	Ekurhuleni Metropolitan Municipality Landfill Gas Recovery Project	Recover landfill methane for electricity generation	Methane recovery and flaring	243,629	20	• Approved by DNA	Ekurhuleni Metropolitan Municipality
21	26/05/2008	Alton Landfill Gas to Electricity Project	Recover landfill methane for electricity generation	Methane recovery	70,000	10	• Registered on 24 August 2009	Energ Systems uMhlathuze (Pty) Ltd

				and flaring				
22	07/07/2008	New Energies Commercial Solar Water Heating Programme in South Africa	Retrofit electric water heaters with solar-based technology, install solar water heaters at large scale hot water users	Renewable energy	96,780	10	• PDD under review by DNA • Outstanding documents	Prostart Traders 40 (Pty) Ltd t/a NewEnergies (Pty) Ltd
23	08/07/2008	Karbochem Combined Heat and Power Project (Newcastle Co-generation Project)	Replace coal with gas as an energy source for steam production	Co-generation	322,000	21	• PDD under review by DNA • Outstanding documents	IPSA Group PLC
24	17/07/2008	Boskor Renewable Electricity Plant (BREP)	Generate electricity from sawmill residues for grid	Renewable energy	14,010	10	• PDD under review by DNA • Outstanding documents	MTO Forestry (Pty) Ltd
25	10/12/2008	The Gluten 20 Dryer of Tongaat Hulett Starch Fuel Switch Project	Replace coal with natural gas as an energy source	Fuel switch	8,360	14	• PDD under review by DNA • Outstanding documents	Tongaat Hulett Starch Property Limited
26	20/04/2009	New England Landfill Gas to Energy Project	Recover landfill methane for electricity generation	Methane recovery and flaring	53,652	7	• Approved by DNA	Ecosecurities South Africa (Pty) Ltd

27	23/06/2009	CCE Solutions Biomass to Electricity Project	Generate electricity from biomass for grid	Biomass	54,153	10	• Approved by DNA	Mr C. Eleftheriades
28	03/08/2009	Omnia Steam Turbine Project	Generate electricity from wasted pressure release	Industrial process (Energy supply)	14,765	7	• PDD under review by DNA • Outstanding documents	Omnia Fertilizer Ltd
29	14/12/2009	BioTherm Hernic Ferrochrome Co-generation Project	Flare CO-rich off gas into CO_2, produce electricity for the grid	Industrial process	186,189	10	• PDD under review by DNA • Outstanding documents	BioTherm Energy (Pty) Ltd
30	26/04/2010	Heat Retention Cooking in South Africa	Introduce Wonder Bag, a heat-retention cooker	Energy efficiency	153,492	7	• Approved by DNA	Natural Balance (Pty) Ltd
31	29/04/2010	Lowpal Timbers Wood Waste to Energy Project in Sabie, SA	Generate electricity from wood waste; prevent methane emissions from anaerobic decomposition	Renewable energy	18,889	7	• PDD under review by DNA • Outstanding documents	EECO Fuels Renewable Energy Company
32	15/06/2010	Capture and Utilisation of Methane at GFI Mining's Beatrix Mine	Recover mine and non-mine methane for electricity generation	Methane recovery and flaring	212,730	7	• PDD under review by DNA • Outstanding documents	GFI Mining SA (Pty) Ltd & Promethium Carbon (Pty) Ltd

33	22/06/2010	Sasol Gas Turbine Co-generation at Sasol Secunda Synfuels Plant	Replace grid electricity with electricity generated onsite using natural gas and project fuel	Fuel switch	1,204,444	10	• PDD approved by the DNA on 19/08/2010	Sasol Synfuels (Pty) Ltd
34	25/08/2010	SASSA Low Pressure Solar Water Heater Programme	Install low pressure solar water heaters in low income households	Renewable Energy	80,188	10	• PDD under review by DNA	International Carbon
35	18/10/ 2004	Kouga Wind Farm / Pumped Storage Hydro	Generate electricity from wind and dammed water	Renewable energy	26,000	21	• PIN approved by DNA	Genesis Eco Energy (Pty) Ltd
36	28/01/2005	Sasol Limited Natural Gas Conversion Project	Replace coal with natural gas as feedstock at 2 plants	Fuel switch	6,490,000	10	• PIN approved by DNA	Sasol Synfuels (Pty) Ltd
37	30/08/2005	Meyerton Bio-Diesel Project	Production of bio-diesel from waste vegetable oils	Bio-fuel production	90,000	10	• PIN approved by DNA	Exclusive Access Trading (Pty) Ltd
38	23/09/2005	Mafikeng Bio-Diesel	Production of bio-diesel from waste vegetable oils	Bio-fuel production	327,000	30	• PIN approved by DNA	Mafikeng Bio-diesel
39	19/01/2006	Chrome Smelter Fuel Switch	Production of electricity from smelter off-gasses for	Co-	600,000	20	• PIN approved by DNA	Envigas (Pty) Ltd

		Project	onsite use	generation				
40	19/01/2006	Alrode Bio-diesel	Production of bio-diesel from soya and palm oils	Bio-fuel production	189,000	21	• PIN approved by DNA	Exclusive Access Trading (Pty) Ltd
41	28/03/2006	Concentrated Solar Thermal Electricity Generation Project	Generate electricity from concentrated solar for grid	Energy efficiency	375,000	35	• PIN approved by DNA	Eskom Holdings Ltd
42	28/03/2006	Coal Plant Precipitators Energy Efficiency Project	Efficient use of electricity at Eskom's Matimba power station	Energy efficiency	12,000	32	• PIN approved by DNA	Eskom Holdings Ltd
43	28/03/2006	Gariep Hydroelectric Upgrade Project	Increase generation capacity of the Gariep hydroelectric power station	Energy efficiency	77,000	30	• PIN approved by DNA	Eskom Holdings Ltd
44	08/06/2006	Vanadium Iron Smelter Energy Efficiency Project	Reduce energy consumption during production process at Witbank facility	Energy efficiency	36,000	10	• PIN approved by DNA	Highveld Steel & Vanadium
45	22/06/2006	Siyanda Bio-Diesel	Install and operate a bio-diesel production plant	Bio-fuel production	275,000	7	• PIN approved by DNA • PDD at final stage of preparation	Siyanda Biodiesel (Pty) Ltd

46	20/07/2006	Tshwane-Lilanda Methane Gas Project	Generate electricity from methane recovered from 9 landfill sites around Pretoria	Methane recovery and flaring	803,000	10	• PIN approved by DNA	Lilanda Holdings (Pty) Ltd
47	28/08/2006	NCP Coal to Gas Fuel Switching Project	Replace coal with methane gas at NCP manufacturing facility	Fuel switch	50,000	10	• PIN approved by DNA • PDD at final stage of preparation	NCP Alcohols (Pty) Ltd
48	20/09/2006	Letaba Biomass Fuel Switching Project	Replace coal with biomass to generate steam	Fuel switch	19,000	10	• PIN approved by DNA • PDD at final stage of preparation	BioTherm SPV 2 (Pty) Ltd
49	25/09/2006	NOPI - National Organic Produce Initiative	Introduce hemp biomass, lime and wood as construction media for low cost housing	Fuel switch	50,000	10	• PIN approved by DNA	International Consortium of Future Energies
50	14/12/2006	Tongaat-Hulett Co-generation Project	Increase electricity generation capacity of Tongaat plant	Co-generation	55,000	21	• PIN approved by DNA • PDD at final stage of preparation	Tongaat-Huletts Go-generation Company
51	15/12/2006	SCAW Fuel Switch Project	Replace coal with natural gas	Fuel switch	130,000	10	• PIN approved by DNA	SCAW Metals (Pty) Ltd

52	21/12/2006	Mittal Steel Waste Heat to Energy Project	Capture waste heat to generate electricity	Co-generation	200,000	10	• PIN approved by DNA	Mittal Steel
53	19/01/2007	Samancor Chrome Electricity from Furnace Offgas Project	Generate electricity from waste energy	Co-generation	184,000	21	• PIN approved by DNA	Samancor
54	16/03/2007	Molten Slag and Metal Project	Promote energy efficiency at the Metalloys, Samancor Meyerton works	Energy efficiency	200,000	21	• PIN approved by DNA • PDD at final stage of preparation	Molten Slag and Metal (Pty) Ltd
55	20/02/2007	Orange-Fish River Small Hydro Power Project	Generate hydro-electric power	Renewable energy	60,000	21	• PIN approved by DNA	Clackson Power Company (Pty) Ltd
56	11/02/2007	Southern Cape Cleaner Energy Project	Generate electricity from biomass	Renewable energy	50,000	25	• PIN approved by DNA • PDD at final stage of preparation	Carbon and Environ-mental Options (Pty) Ltd
57	04/05/2007	Biomass Based Combined Heat and Power Plant	Refurbish turbines to improve energy efficiency and produce power	Energy efficiency	21,000	15	• PIN approved by DNA	Mr P. Reyneke
58	17/05/2007	Saldanha Bay Clean Fuel Switch Project	Replace coal-fired power station with gas-fired power station	Fuel switch	20,170,000	40	• PIN approved by DNA	Prof F. Cornish

59	25/05/2007	Compact Fluorescent Lighting (CFL) in Sol Plaatjie Municipality	Reduce energy use for lighting	Energy efficiency	7,000	21	• PIN approved by DNA • PDD at final stage of preparation	The PACE Centre
60	08/06/2007	Production of electricity from combustion of bagasse, KwaZulu-Natal	Install new biomass residue fired power generation plant	Co-generation	90,000	10	• PIN approved by DNA • PDD at final stage of preparation	African Biofuels Company (Pty) Ltd
61	08/06/2007	Production of Ethanol from Sugarcane, KwaZulu-Natal	Replace petrol with bio-ethanol for transportation	Bio-fuel production	77,000	7	• PIN approved by DNA	African Biofuels Company (Pty) Ltd
62	15/06/2007	Sasol Secunda Gas Turbine Combine Cycle Project	Generate electricity from natural or synthetic gas	Fuel switch	1,600,000	10	• PIN approved by DNA • PDD at final stage of preparation	Sasol Synfuels
63	19/09/2007	New Denmark Colliery Methane Destruction Project	Destruction of methane from New Denmark Colliery by flaring	Methane recovery and flaring	27,000	20	• PIN approved by DNA	Anglo Coal
64	28/09/2007	100 MW West Coast Wind Farm	Generate renewable energy from wind	Renewable energy	278,000	21	• PIN approved by DNA	Eskom Holdings Ltd
65	29/11/2007	Sasol Secunda 2nd stage Rectisol Off-gas Methane	Reduce methane emissions by using off-gas in gas turbine to generate	Methane recovery	1,600,000	10	• PIN approved by DNA	Sasol Synfuels Secunda

		Reduction Project	electricity	and flaring				
66	30/11/2007	The Lion Phase 1 and Phase 2 Ferrochrome Smelter Surplus Furnace Gas Electricity Generation Project	Replace fossil fuels with surplus furnace gas for electricity generation	Co-generation	142,960	21	• PIN approved by DNA	IST Holdings (Pty) Ltd t/a PowerTech IST
67	30/11/2007	The Boshoek Ferrochrome Smelter Surplus Furnace Gas Electricity Generation Project	Generate electricity using surplus furnace gas to replace grid electricity	Co-generation	84,000	21	• PIN approved by DNA	IST Holdings (Pty) Ltd t/a PowerTech IST
68	30/11/2007	The Lydenburg Ferrochrome Smelter Surplus Furnace Gas Electricity Generation Project	Generate electricity using surplus furnace gas to replace grid electricity	Co-generation	71,480	21	• PIN approved by DNA	Xstrata (Pty) Ltd
69	14/12/2007	The Use Of Slag As A Partial Raw Material In The Clinker Manufacturing Process	Substitute existing raw materials with non-carbonated raw materials in the clinker manufacturing process;	Industrial process	142,000	20	• PIN approved by DNA	PPC (Pty) Ltd

			reduce fuel usage as a result of the substitute					
70	24/01/2008	Assmang Waste Gas Utilisation At Machadodorp And Cato Ridge	Use the furnace off-gas from existing plants to generate electricity	Co-generation	200,000	21	• PIN approved by DNA	Promethium Carbon (Pty) Ltd & Exxaro Coal (Pty) Ltd
71	07/02/2008	South Africa GeoPower – SAGP 1	Produce geo-thermal electricity and supply to grid	Renewable energy	416,000	30	• PIN approved by DNA	Dr G.W. Oprisko
72	14/02/2008	Namakwa Sands Waste Gas Utilisation	Use the furnace off-gas from existing plant to generate electricity	Co-generation	150,000	7-15	• PIN approved by DNA	Promethium Carbon (Pty) Ltd & Exxaro Coal (Pty) Ltd
73	15/02/2008	KZN Sands Furnace Off-Gas Utilisation	Use the furnace off-gas from existing plant to generate electricity	Co-generation	380,000	21	• PIN approved by DNA	Promethium Carbon (Pty) Ltd & Exxaro Coal (Pty) Ltd
74	15/02/2008	Generation of Electricity from the Exxaro Char Plant and the Exxaro Coke Furnace Off-Gas	Use the furnace off-gas from existing plant to generate electricity	Co-generation	140,000	21	• PIN approved by DNA	Promethium Carbon (Pty) Ltd & Exxaro Coal (Pty) Ltd

75	15/02/2008	Samancor Chrome Furnace Off-Gas Utilization At Witbank and Middelburg	Use the furnace off-gas from existing plant to generate electricity	Co-generation	150,000	21	• PIN approved by DNA	Promethium Carbon (Pty) Ltd & Exxaro Coal (Pty) Ltd
76	29/02/2008	Red Signal	Achieve national control by means of existing advanced technology, over 5 GW of energy demand	Energy efficiency	20,000,000	5	• PIN approved by DNA	Messrs B. Forrer & K. Hellon
77	08/04/2008	The Bulbul Drive Landfill Gas Electricity Generation Project	Extraction of landfill gas to generate electricity	Waste manage-ment	752,000	10	• PIN approved by DNA	Carbon Reductions South Africa
78	17/04/2008	IFM Integrated Clean Energy Project	Use the furnace off-gas from existing plant to generate electricity	Co-generation	127,000	30	• PIN approved by DNA	AAP Carbon Ltd.
79	21/04/2008	ArcelorMittal Steel SA Variable Speed Drive Energy Management System	Reduce energy consumption at the hot strip mill at Saldanha Steel	Energy efficiency	16,500	10	• PIN in review process by DNA	ArcelorMittal Steel SA
80	21/04/2008	ArcelorMittal Steel SA Waste Pressure Recovery Project	Capture wasted pressure at blast furnaces to	Co-generation	94,000	10	• PIN in review process by DNA	ArcelorMittal Steel SA

			generate electricity					
81	24/04/2008	Green Waste to Energy Project	Substitute conventional fossil fuel energy source to generate steam	Co-generation	25,600	10	• PIN approved by DNA	Mr C. Meyer
82	25/04/2008	Green Energy Plants (Biomass from Wood Waste and Forest Residue)	Install a biomass fuelled power facility	Co-generation	258,379	21	• PIN approved by DNA	ArcelorMittal Steel SA
83	27/05/2008	PFG Glass Springs Plant Retrofit	Retrofit assembly to facilitate fuel switch to natural gas	Fuel switch	150,000	10	• PIN approved by DNA	PFG Glass (Pty) Ltd
84	30/05/2008	CDM Solar Cooker Project Sinthumele, South Africa	Use solar energy for cooking	Renewable energy	50,500	14	• PIN approved by DNA	African Carbon Solution
85	03/06/2008	Fuel Switch in Cement Manufacturing	Partial substitution of fossil fuels with alternative or less carbon intensive fuels in cement manufacture	Biomass	25,000	10	• PIN approved by DNA	PPC (Pty) Ltd
86	18/06/2008	NEEA Retrofitting Of High Performance LED Lighting	Replace incandescent light bulbs with high	Energy efficiency	16,096	10	• PIN approved by DNA	FireFly Carbon

			performance LED lights to promote energy efficiency					
87	19/06/2008	Industrial Bio-Coal Project	Convert organic waste into bio-coal to replace A-grade steam coal	Waste manage-ment	212,100	7 (14)	• PIN approved by DNA	Agro Technologies
88	08/07/2008	Rea-Vaya Bus Rapid Transit (BRT) Project	Establish a sustainable mass urban transport system	Transport	370,148	21	• PIN approved by DNA	City of Johannesburg
89	08/07/2008	Cosmo City Solar Water Heater Project, Johannesburg	Install high efficiency solar water heaters at low-income housing	Renewable energy	58,641	21	• PIN approved by DNA	City of Johannesburg
90	14/08/2008	TSB Sugar RSA Komati Mill Co-generation Project	Use baggasse to generate electricity for export	Biomass	50,329	10	• PIN approved by DNA	TSB Sugar
91	21/08/2008	St Albans Prison Methane Capturing and Electricity Generation Project	Generate electricity through use of wastewater gas at domestic wastewater plant	Waste manage-ment	59	7	• PIN approved by DNA	Nelson Mandela Metro
92	27/08/2008	Thos Begbie Project	Generate electricity	Fuel switch	173,356	12	• PIN approved by DNA	Mr G. van Zyl

			through using gas instead of coal					
93	09/09/2008	The Buffalo City Landfill Gas to Electricity Clean Development Mechanism Project	Extract gas from three landfill sites to generate electricity	Methane recovery and flaring	140,000	10	• PIN approved by DNA	Mr L. Strachan
94	11/09/2008	The ABSA Towers West Energy Centre Project	Install gas-fired CHP generators to produce electricity and heat for ABSA campus	Fuel switch	12,000	10	• PIN approved by DNA	Mr K. Gafnet
95	30/09/2008	Trade Plus Aid Commercial and Domestic Biogas Programme	Use biogas to generate electricity for domestic use on diary and pig farms around SA	Waste manage-ment	176,000	7	• PIN approved by DNA	Trade Plus Aid Africa
96	21/10/2008	TATA Steel KZN Integrated Clean Energy Project	Use the furnace off-gas from existing plant to generate electricity	Co-generation	96,000	10	• PIN approved by DNA	AAP Carbon Ltd.
97	31/10/2008	Highland Exploration and Production (Pty) Ltd Mine	Replace coal fired power generating capacity with	Methane recovery	180,000	21	• PIN approved by DNA	Mr P.D. Price

		Methane Utilization for Power Generation Project	captured methane	and flaring				
98	05/11/2008	Retrofit Kinetic Energy Recovery System	Save fuel and emissions in transport fleets through fitting kinetic energy recovery systems	Transport	402,000	7	• PIN approved by DNA	Mr D. Baylis
99	21/11/2008	Calgro M3 Green Project	Install insulated ceilings, solar water heaters and energy efficient lighting in urban housing projects	Renewable energy	40,000	10	• PIN approved by DNA	Calgro M3
100	24/11/2008	Pelletizing and Sintering Plant 3 (PSP3)	Increase efficiency in ferrochrome production	Energy efficiency	50,000	10	• PIN approved by DNA	Samancor (Pty) Ltd
101	10/12/2008	Kloof #3 Ice Chiller Project	Introduce ice-chiller system to replace water as the carrier of chill energy	Energy efficiency	60,441	21	• PIN approved by DNA	Goldfields
102	12/12/2008	BioTherm Adcock Ingram Fuel Switching Project	Replace grid electricity and coal derived steam with natural gas for heat and energy	Fuel switch	23,480	10	• PIN approved by DNA	CDM Africa Climate Solutions

103	12/01/2009	Dissemination of Institutional Fuel Efficient Biomass Stoves in SA	Manufacture and disseminate fuel efficient biomass stoves to schools and other institutions	Renewable energy	3,000	10	• PIN approved by DNA	Mr M. Mabaso
104	03/02/2009	Nelson Mandela Bay Metropolitan's Landfill Gas Project	Extract gas from two landfill sites to generate electricity	Waste manage-ment	90,000	10	• PIN approved by DNA	CEF (Pty) Ltd
105	13/02/2009	Umoya Energy	Establish new wind energy facility on three farms near Hopefield, Western Cape	Renewable energy	250,000	21	• PIN approved by DNA	Mr D Jenman
106	20/02/2009	Nelson Mandela Bay Municipality Solar Water Heating Project	Replace conventional water heating with solar water heating	Renewable energy	280,000	21	• PIN approved by DNA	CEF (Pty) Ltd
107	24/02/2009	Nelson Mandela Bay Metropolitan Street Lighting Efficiency Project	Upgrade street lighting with more efficient luminaries	Energy efficiency	15,000	10	• PIN approved by DNA	CEF (Pty) Ltd
108	24/02/2009	Energy Management at Nelson Mandela Bay	Reduce energy use at 6 wastewater treatment	Waste manage-	9,000	10	• PIN approved by DNA	CEF (Pty) Ltd

		Metropolitan's Waste Water Treatment Facilities Project	facilities in Metro area	ment				
109	02/04/2009	Ethanol-to-Ethylene: Substation of Fossil Derived Ethylene with Bio-Ethanol Feedstock at Safripol HDPE Plant	Substitute fossil derived ethylene feedstock with biomass derived feedstock in the production of high density polyethylene	Fuel switch	1,000,000	14	• PIN approved by DNA	Safripol (Pty) Ltd
110	02/04/2009	Fuel Switch From Coal to Biomass at Brick & Clay (Pty) Ltd, SA	Replace coal with biomass in existing brick-firing kilns and chain grade stocker	Fuel switch	18,474	7 (21)	• PIN approved by DNA	Argo Technologies
111	02/04/2009	Fuel Switch From Coal to Biomass at Blueberry Hills Ltd, SA	Replace coal with biomass fuel in existing boilers	Fuel switch	8,819	7(21)	• PIN approved by DNA	Argo Technologies
112	02/04/2009	Fuel Switch from Coal to Biomass at Summerpride Foods, SA	Replace coal with biomass fuel in existing boilers	Fuel switch	26,093	7(21)	• PIN approved by DNA	Argo Technologies
113	02/04/2009	Fuel Switch Coal to Biomass at East London Abattoir, SA	Replace coal with biomass fuel in existing boilers	Fuel switch	18,474	7(21)	• PIN approved by DNA	Argo Technologies

114	07/04/2009	Nelson Mandela Bay Municipality Wind Power Project	Establish new 60 MW wind energy facility for supply to grid	Renewable energy	5,679,538	10	• PIN approved by DNA	CEF (Pty) Ltd
115	08/04/2009	Khwe Khoa Langfontein Wind Energy Project	Establish new 120 MW wind energy facility near Yzerfontein, Western Cape	Renewable energy	56,795	10	• PIN approved by DNA	CDM Africa Climate Solutions
116	17/04/2009	Kerrifontein Wind Farm Project	Demonstrate the technical viability and financial feasibility of wind energy in South Africa	Renewable energy	223,000	10	• PIN approved by DNA	Oelsner Group (Pty) Ltd
117	18/05/2009	National CDM Facilities PPP Between Second Economy and Public Sector	CDM project design, formulation, facilitation, and engineering and management capacity for the 'second economy' and the public sector	Waste manage-ment	To be confirmed	7	• PIN in review process by DNA	Messrs TA Revert and L Gadzikwa
118	22/05/2009	Mitigation of Methane Emissions in the Charcoal Production of Silicon	Reduce methane emissions in charcoal production by burning off-	Industrial process	30,000	10	• PIN approved by DNA	Messrs B Olivier & A Kuhl

		Smelters in South Africa	gasses					
119	22/05/2009	Rand Carbide FerroSilicon Energy Efficiency and Reductant Substitution Project	Introduce renewable reductants and promote energy efficiency	Industrial process	184,000	10	• PIN approved by DNA	Rand Carbide (Pty) Ltd
120	28/05/2009	Nelson Mandela Bay Metropolitan Hydro Power Project	Produce hydroelectricity for grid	Renewable energy	109,158	10	• PIN approved by DNA	CEF (Pty) Ltd
121	29/05/2009	Bellville Landfill Gas Project	Extract gas from several landfill sites in Cape Town to generate electricity	Waste manage-ment	193,595	10	• PIN approved by DNA	CEF (Pty) Ltd
122	29/05/2009	Coastal Park Landfill Gas Project	Extract gas from several landfill sites in Cape Town to generate electricity	Waste manage-ment	153,164	10	• PIN approved by DNA	CEF (Pty) Ltd
123	29/05/2009	Vissershok Landfill Gas Project	Extract gas from several landfill sites in Cape Town to generate electricity	Waste manage-ment	285,530	10	• PIN approved by DNA	CEF (Pty) Ltd
124	29/05/2009	Faure and Swartklip Landfill	Extract gas from several	Waste	80,573	10	• PIN approved by DNA	CEF (Pty) Ltd

		Gas Project	landfill sites in Cape Town to generate electricity	manage-ment				
125	18/06/2009	Boitshepi Landfill Gas Project	Extract gas from landfill site in Emfuleni Municipality to generate electricity	Waste manage-ment	56,274	10	• PIN approved by DNA	CEF (Pty) Ltd
126	18/06/2009	Waldrift Landfill Gas Project	Extract gas from landfill site in Emfuleni Municipality to generate electricity	Waste manage-ment	5,752	10	• PIN approved by DNA	CEF (Pty) Ltd
127	09/07/2009	Installation of Water Efficient Showerheads or Low Flow Showerheads and Flow Regulators to Reduce Emissions	Install water efficient showerheads and flow regulators to decrease energy consumption	Energy efficiency	7,302,977	7(35)	• PIN approved by DNA	Green Alliance (Pty) Ltd
128	14/07/2009	Ga-Rankuwa and Soshanguve Landfill Gas to Energy Project	Extract gas from several landfill sites in Pretoria to generate electricity	Waste manage-ment	77,073	10	• PIN approved by DNA	CEF (Pty) Ltd

129	14/07/2009	Hatherley & Kwaggasrand Landfill Gas to Energy Project	Extract gas from several landfill sites in Pretoria to generate electricity	Waste manage-ment	79,300	10	• PIN approved by DNA	CEF (Pty) Ltd
130	14/07/2009	Gartskloof & Onderstepoort Landfill Gas to Energy Project	Extract gas from several landfill sites in Pretoria to generate electricity	Waste manage-ment	85,133	10	• PIN approved by DNA	CEF (Pty) Ltd
131	20/07/2009	South Africa Solar Water Heating Project	Replace conventional water heating with solar water heating	Renewable energy	60,000	21	• PIN approved by DNA	Unlimited Energy Resources
132	22/09/2009	Energy Efficiency in Low Cost Housing Developments Project	Improve thermal performance and water heating efficiencies in subsidised housing	Energy efficiency	800,000	21	• PIN approved by DNA	Carbon Programmes (Pty) Ltd
133	28/09/2009	Cape Town Integrated Bus Rapid Transport System Project	Achieve transport efficiency and reduce fuel consumption through the establishment of a Bus Rapid Transport System	Transport	1,400,000	21	• PIN approved by DNA	City of Cape Town

134	18/12/2009	BioTherm PFG Waste Heat Recovery Project	Replace coal with waste heat to generate steam	Waste manage-ment	73,800	10	• PIN approved by DNA	BioTherm (Pty) Ltd
135	18/01/2010	Low Pressure Solar Water Heating Pilot Project for Low-Cost Housing (NMBM)	Replace conventional water heaters with solar water heaters	Renewable energy	3,241	10	• PIN approved by DNA	Nelson Mandela Bay Municipality
136	18/01/2010	Nelson Mandela Bay Metropolitan CFL Project	Replace incandescent light bulbs with compact fluorescent (CFL) lights to promote energy efficiency	Energy efficiency	14,147	10	• PIN approved by DNA	CEF (Pty) Ltd
137	02/2010	Installation of Energy Efficient Cooking Technologies in Households, Institutions and Small Businesses in SA	Promote the sustainable use of biomass for cooking and space heating; and disseminate more efficient paraffin burning appliances	Energy efficiency	60,000	28	• PIN approved by DNA	GTZ
138	05/02/2010	Ekurhuleni Municipality Solar Water Heating Program	Replace conventional water heaters with solar water heaters	Renewable energy	375,233	15	• PIN approved by DNA	CEF (Pty) Ltd

139	15/03/2010	Virtual Power Supply (VPS)	Use high heat industrial processes to improve energy efficiency	Energy efficiency	1,800,000	21	• PIN approved by DNA	Mexel Energy (Pty) Ltd
140	16/03/2010	Massive Introduction of LEDs to Rural Communities	Replace kerosene lights with solar lighting in rural areas	Renewable energy	104,300	10	• PIN approved by DNA	CARE Ltd
141	16/03/2010	Installation of Energy Efficient Cookers in Rural Areas	Supply rural communities with energy efficient stoves	Energy efficiency	2,720,000	10	• PIN approved by DNA	CARE Ltd
142	17/03/2010	Darling Wind Farm Phase 2	Establish new 7.8 MW wind energy facility near Darling for supply to grid	Renewable energy	23,760	10	• PIN approved by DNA	Oelsner Group (Pty) Ltd
143	09/04/2010	Replacement of Incandescent Light Bulbs with Compact Fluorescent Lights in SA	Replace incandescent light bulbs with compact fluorescent (CFL) lights to promote energy efficiency	Energy efficiency	490,000	7	• PIN approved by DNA	CDM Africa Climate Solutions
144	14/04/2010	Distribution of Portable Solar Water Heater for Safe	Supply portable solar water heaters to rural	Renewable energy	1,720,000	10	• PIN approved by DNA	CARE Ltd

		Drinking Purposes	communities					
145	20/04/2010	Low Pressure Solar Water Heating Programme	Replace conventional water heaters with solar water heaters	Renewable energy	244,877	10	• PIN approved by DNA	Solar Academy of Sub-Saharan Africa (Pty) Ltd
146	20/04/2010	The Kerrifontein /Darling Phase 2 Wind Farm Project	Establish new 20.8 MW wind energy facility near Darling for supply to grid	Renewable energy	633,600	10	• PIN approved by DNA	Oelsner Group (Pty) Ltd
147	13/05/2010	The eThekwini Mini-Hydro Electricity Generation Project	Produce hydroelectricity for grid	Renewable energy	12,000	14(21)	• PIN approved by DNA	eThekwini Municipality
148	13/05/2010	The eThekwini Western Aqueduct Hydro Electricity Generation Project	Produce hydroelectricity for grid	Renewable energy	34,407	14(21)	• PIN approved by DNA	eThekwini Municipality
149	13/05/2010	The eThekwini Southern Wastewater Treatment Works Anaerobic Digestion Biogas to Energy Project	Harvest methane-rich biogas from sewage sludge and use for electricity generation	Methane recovery & flaring	97,038	14(21)	• PIN approved by DNA	eThekwini Municipality
150	13/05/2010	The Mariannhill Mechanical Biological Waste Treatment	Reduce waste disposal to landfill volumes	Methane recovery &	24,872	14(21)	• PIN approved by DNA	eThekwini Municipality

		to Energy Project		flaring				
151	14/05/2010	CSP South Africa	Create new clean energy industry	Renewable energy	525,600	14	• PIN under review by DNA	Farina Energy Trust
152	20/05/2010	LED's Kick-off	Replace incandescent light units with LED lights to promote energy efficiency	Energy efficiency	560,000	28	• PIN approved by DNA	Mr J Hornman
153	27/05/2010	Rance Timber Biomass-to-Energy Project	Use biomass by-products for heat and electricity generation for onsite use	Biomass	75,000	21	• PIN approved by DNA	Rance Timber (Pty) Ltd
154	23/06/2010	Kruisvallei Hydro Electricity Project	Produce hydroelectricity for grid	Renewable energy	34,000	10	• PIN approved by DNA	Kruisvallei Hydro (Pty) Ltd
155	16/07/2010	eThekwini Municipality Solar Water Heaters Programme	Replace conventional water heaters with solar water heaters	Renewable energy	27,580	10	• PIN under review by DNA	eThekwini Municipality
156	05/08/2010	Grahamstown Invasive Biomass Power Project	Use invasive biomass for electricity generation for supply to grid	Renewable energy	21,000	21	• PIN under review by DNA	Nollen Group

157	26/08/2010	eThekwini Energy Efficient Street Lighting and Robots	Reduce energy consumption in the eThekwini municipal infrastructure	Energy efficiency	16,431	10	• PIN under review by DNA	eThekwini Municipality
158	07/09/2010	DWS Anaerobic Digestion Waste Treatment to Energy project	Reduce waste disposal to landfill by treatment of food and organic wastes	Waste manage-ment	18,120	14	• PIN approved by DNA	Don't Waste
159	09/09/2010	Electrawinds Sisonke Energy	Generate electricity from wind	Renewable energy	263,000	10	• PIN approved by DNA	Sisonke Energy
160	14/09/2010	Kasi Rural Outreach	To utilise energy efficient technology powered by renewable energy	Renewable energy	337,146	21	• PIN approved by DNA	iBurst Group (Pty) Ltd
161	16/09/2010	Wind Farm Beaufort West Phase 1	To use wind turbines to generate electricity	Renewable energy	189,000	20	• PIN under review by DNA	Astrum Energy (pty) Ltd
162	17/09/2010	Heat Pump and Hybrid Solution Programme for South Africa	Install heat pump and hybrid systems in high income households and SME throughout South	Renewable energy	237,528	10	• PIN under review by DNA	International Carbon

			Africa					
163	07/10/2010	Standard Bank Efficient Lighting Programme of Activities	To install energy efficient lighting technologies and systems in commercial buildings across South Africa	Energy efficiency	6,869	10	• PIN under review by DNA	Standard Bank
164	12/10/2010	Grid Connected Wind Power Plant in Lamberts Bay, South Africa	To use wind turbines to generate electricity	Renewable energy	145,230	25	• PIN under review by DNA	G7 Energies
165	12/10/2010	Grid Connected Wind Power Plant in Richtersveld, South Africa	To use wind turbines to generate electricity	Renewable energy	608,730	25	• PIN under review by DNA	G7 Energies
166	12/10/2010	Grid Connected Wind Power Plant in Klawer, South Africa	To use wind turbines to generate electricity	Renewable energy	96,820	25	• PIN under review by DNA	G7 Energies
167	12/10/2010	Grid Connected Wind Power Plant in Roggeveld, South Africa	To use wind turbines to generate electricity	Renewable energy	2,030,130	25	• PIN under review by DNA	G7 Energies
168	12/10/2010	Grid Connected Wind Power	To use wind turbines to	Renewable	484,100	25	• PIN under review by DNA	G7 Energies

		Plant in Witberg, South Africa	generate electricity	energy				
169	13/10/2010	SA Calcium Carbide Furnace Waste Gas to Electricity CDM project	To develop an 8MW electricity generation capacity project utilising furnace waste off-gas	Fuel switch	46,000	30	• PIN under review by DNA	SA Carbide (Pty) Ltd
170	18/10/2010	Indwe Wind Project	To use wind turbines to generate electricity	Renewable energy	135,000	21	• PIN under review by DNA	Rainmaker Energy
171	18/10/2010	Dorper Wind Project	To use wind turbines to generate electricity	Renewable energy	1,380,000	21	• PIN under review by DNA	Rainmaker Energy

(Source | South Africa, 2010(a):unnumbered)

ADDENDUM 8 | CER EXPORTS PER PROJECT CATEGORY

Projected revenue from export of CERs generated through the South African CDM project pipeline per project category:

Bio-fuel				
	Volume (tCO_2e)	Price per ton ($)		
		16.8	23.8	30.8
Per Annum	958 000	16 094 400	22 800 400	29 506 400
Period (min)	17 143 000	288 002 400	408 003 400	528 004 400
	Volume (tCO_2e)	Price per ton (ZAR)		
		115.92	164.22	212.52
Per Annum	958 000	111 051 360	157 322 760	203 594 160
Period (min)	17 143 000	1 987 216 560	2 815 223 460	3 643 230 360
Biomass				
	Volume (tCO_2e)	Price per ton ($)		
		16.8	23.8	30.8
Per Annum	204 482	3 435 298	4 866 672	6 298 046
Period (min)	2 869 820	48 212 976	68 301 716	88 390 456
	Volume (tCO_2e)	Price per ton (ZAR)		
		115.92	164.22	212.52
Per Annum	204 482	23 703 553	33 580 034	43 456 515
Period (min)	2 869 820	332 669 534	471 281 840	609 894 146
Co-generation				
	Volume (tCO_2e)	Price per ton (millions of $)		
		16.8	23.8	30.8
Per Annum	4 229 419	71 054 239	100 660 172	130 266 105
Period (min)	72 250 199	1 213 803 343	1 719 554 736	2 225 306 129
Period (max)	73 450 199	1 233 963 343	1 748 114 736	2 262 266 129
	Volume	Price per ton (millions of $)		

	(tCO_2e)	115.92	164.22	212.52
Per Annum	4 229 419	490 274 250	694 555 188	898 836 126
Period (min)	72 250 199	8 375 243 068	11 864 927 680	15 354 612 291
Period (max)	73 450 199	8 514 347 068	12 061 991 680	15 609 636 291
Energy efficiency				
	Volume	Price per ton (millions of $)		
	(tCO_2e)	16.8	23.8	30.8
Per Annum	34 899 953	586 319 210	830 618 881	1 074 918 552
Period (min)	279 222 974	4 690 945 963	6 645 506 781	8 600 067 599
Period (max)	483 706 330	8 126 266 344	11 512 210 654	14 898 154 964
	Volume	Price per ton (millions of $)		
	(tCO_2e)	115.92	164.22	212.52
Per Annum	34 899 953	4 045 602 552	5 731 270 282	7 416 938 012
Period (min)	279 222 974	32 367 527 146	45 853 996 790	59 340 466 434
Period (max)	483 706 330	56 071 237 774	79 434 253 513	102 797 269 252
Fuel switch				
	Volume	Price per ton ($)		
	(tCO_2e)	16.8	23.8	30.8
Per Annum	31 525 500	529 628 400	750 306 900	970 985 400
Period (min)	926 218 572	15 560 472 010	22 044 002 014	28 527 532 018
Period (max)	927 224 612	15 577 373 482	22 067 945 766	28 558 518 050
	Volume	Price per ton (ZAR)		
	(tCO_2e)	115.92	164.22	212.52
Per Annum	31 525 500	3 654 435 960	5 177 117 610	6 699 799 260
Period (min)	926 218 572	107 367 256 866	152 103 613 894	196 839 970 921
Period (max)	927 224 612	107 483 877 023	152 268 825 783	197 053 774 542
Industrial process				
	Volume			Price per ton ($)
	(tCO_2e)	16.8	23.8	30.8

Per Annum	556 954	9 356 827	13 255 505	17 154 183
Period (min)	6 945 245	116 680 116	165 296 831	213 913 546
	Volume (tCO_2e)	Price per ton (ZAR)		
		115.92	164.22	212.52
Per Annum	556 954	64 562 108	91 462 986	118 363 864
Period (min)	6 945 245	805 092 800	1 140 548 134	1 476 003 467
Methane				
	Volume (tCO_2e)	Price per ton ($)		
		16.8	23.8	30.8
Per Annum	4 060 921	68 223 473	96 649 920	125 076 367
Period (min)	47 732 994	801 914 299	1 136 045 257	1 470 176 215
Period (max)	48 586 364	816 250 915	1 156 355 463	1 496 460 011
	Volume (tCO_2e)	Price per ton (ZAR)		
		115.92	164.22	212.52
Per Annum	4 060 921	470 741 962	666 884 447	863 026 931
Period (min)	47 732 994	5 533 208 664	7 838 712 275	10 144 215 885
Period (max)	48 586 364	5 632 131 315	7 978 852 696	10 325 574 077
N_20				
	Volume (tCO_2e)	Price per ton ($)		
		16.8	23.8	30.8
Per Annum	1 700 000	28 560 000	40 460 000	52 360 000
Period (min)	23 336 000	392 044 800	555 396 800	718 748 800
Period (max)	23 336 000	392 044 800	555 396 800	718 748 800
	Volume (tCO_2e)	Price per ton (ZAR)		
		115.92	164.22	212.52
Per Annum	1 700 000	197 064 000	279 174 000	361 284 000
Period (min)	23 336 000	2 705 109 120	3 832 237 920	4 959 366 720
Period (max)	23 336 000	2 705 109 120	3 832 237 920	4 959 366 720
Renewable energy				

	Volume (tCO_2e)	Price per ton ($)		
		16.8	23.8	30.8
Per Annum	17 581 781	295 373 921	418 446 388	541 518 855
Period (min)	273 686 143	4 597 927 202	6 513 730 203	8 429 533 204
Period (max)	274 010 992	4 603 384 666	6 521 461 610	8 439 538 554
	Volume (tCO_2e)	Price per ton (ZAR)		
		115.92	164.22	212.52
Per Annum	17 581 781	2 038 080 054	2 887 280 076	3 736 480 098
Period (min)	273 686 143	31 725 697 697	44 944 738 403	58 163 779 110
Period (max)	274 010 992	31 763 354 193	44 998 085 106	58 232 816 020
Transport				
	Volume (tCO_2e)	Price per ton ($)		
		16.8	23.8	30.8
Per Annum	2 172 148	36 492 086	51 697 122	66 902 158
Period (min)	39 987 108	671 783 414	951 693 170	1 231 602 926
	Volume (tCO_2e)	Price per ton (ZAR)		
		115.92	164.22	212.52
Per Annum	2 172 148	251 795 396	356 710 145	461 624 893
Period (min)	39 987 108	4 635 305 559	6 566 682 876	8 498 060 192
Waste Management				
	Volume (tCO_2e)	Price per ton ($)		
		16.8	23.8	30.8
Per Annum	2 347 473	39 437 546	55 869 857	72 302 168
Period (min)	22 382 733	376 029 914	532 709 045	689 388 176
Period (max)	23 867 433	400 972 874	568 044 905	735 116 936
	Volume (tCO_2e)	Price per ton (ZAR)		
		115.92	164.22	212.52
Per Annum	2 347 473	272 119 070	385 502 016	498 884 962
Period (min)	22 382 733	2 594 606 409	3 675 692 413	4 756 778 417

Period (max)	23 867 433	2 766 712 833	3 919 509 847	5 072 306 861

Source: Based on data from the South African Designated Authority (South Africa, 2010(a):unnumbered).