

WASTE MANAGEMENT PRACTICES AT THE UNIVERSITY OF STELLENBOSCH: AN ENVIRONMENTAL MANAGEMENT PERSPECTIVE

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DECLARATION

I, the undersigned, hereby declare that the work contained in this thesis is my original work and that I have not previously in its entirety or in part submitted it at any university for a degree.

Signature:

Date:

ABSTRACT

As the world enters a new millennium, global awareness of environmental issues have reached new heights. No longer is the environment seen as an all-absorbing and all-providing resource. Rather, there exists a greater awareness that without active management, the inherent risks and hazards – posed by both the natural environment and humankind's interaction with this environment – will be realised. In order to ensure a sustainable co-existence, humanity's interaction with the surrounding environment must be managed in a responsible manner. In this regard, all aspects of this interaction require attention. Various frameworks, manifested in a variety of forms, have been proposed.

One of the most basic aspects of species existence is the generation of waste. Human existence is no different. However, as a result of the variety of activities that characterise humans' existence on Earth, the generation of waste represents the most tangible and probably the most threatening aspect of this interaction. This study focuses on waste management from an environmental perspective at a specific institution, namely the University of Stellenbosch.

In terms of its findings, the study has established the applicability of various regulatory and institutional frameworks within which the University operate. These frameworks address the role of the University both in terms of waste management and sustainable development. It has established the types of waste generated, the generating processes, the storage, and removal and disposal characteristics of waste management at the University. Waste management at the University is determined to be complex and fragmented, the result of a variety of activities occurring. It has established that limited waste minimisation and reduction activities occur, even though the University had identified effective and efficient resource use as a strategic priority. Although attempts at improving waste management are admittedly underway, the study has found that adopting an environmental management system approach to waste management will enable the University to meet pending legislative and institutional environmental commitments.

OPSOMMING

Met die binnetree van 'n nuwe millennium het wêreldwye bewustheid van omgewingskwessies nuwe hoogtes bereik. Die omgewing word nie meer bloot beskou as 'n alles-absorberende en alles-voorsienende hulpbron nie. Veel eerder groei bewustheid van die noodsaak vir aktiewe bestuursingryping om die gevare en bedreigings inherent aan die natuurlike omgewing, en die mens se interaksie daarmee, die hoof te bied. Ter wille van volhoubare saambestaan moet die mens-omgewing interaksie op verantwoordelike wyse bestuur word. Alle aspekte van hierdie interaksie vereis aandag en 'n verskeidenheid raamwerke in 'n verskeidenheid formate is hiervoor voorgestel.

Die produksie van afval is een van die mees basiese kenmerke van lewensbestaan. Menslike bestaan is nie daarbo verhewe nie. Weens die verskeidenheid aktiwiteite wat menslike bestaan kenmerk, is die produksie van afval die mees tasbare en waarskynlik mees bedreigende manifestasie van mens-omgewing interaksie. Hierdie tesis fokus op afvalbestuur uit die invalshoek van die omgewing, soos dit beslag kry aan 'n spesifieke instansie, naamlik die Universiteit van Stellenbosch.

Die studie het ten aanvang die implikasies van die verskeidenheid regulatoriese en institusionele raamwerke waarin die universiteit opereer, bevestig. Hierdie raamwerke omvat die rol van die Universiteit beide in terme van afvalbestuur en volhoubare ontwikkeling. Die tipes afval wat aan die instansie gegenereer word is geklassifiseer en die genererings-, opbergings-, verwyderings- en verwerkingsprosesse en verantwoordelikhede is vasgestel en gedokumenteer. Afvalbestuur aan die Universiteit blyk kompleks en gefragmenteerd te wees, hoofsaaklik as gevolg van die wye verskeidenheid afval-skeppingsbronne wat hier aangetref word. Ook is bevind dat, ten spyte van die instansie se identifisering van effektiewe hulpbrongebruik as 'n strategiese prioriteit, slegs beperkte afval-inkorting en -reduksie aan die instansie plaasvind. Hoewel daar tans 'n aktiewe proses geloods word om afvalbestuur te verbeter, beveel die studie die aanvaarding, ontwerp en implementering van 'n veel meer wydlopende en holistiese benadering in die vorm van 'n geïntegreerde omgewingsbestuurstelsel aan. Slegs hierdeur sal die Universiteit in staat wees om aan die volgende vlag wetgewing rakende afvalbestuur te voldoen en ook verantwoordelike omgewingsverbintenisse te demonstreer.

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ABBREVIATIONS

AULSF	Association of University Leaders for a Sustainable Future
CRLE	The Center for Respect of Life and Environment
DEAT	Department of Environmental Affairs and Tourism
Division	An operating entity within the US being either a department, institute, bureau, unit or a centre
DGES	Department of Geography and Environmental Studies
DWAF	Department of Water Affairs and Forestry
EMS	Environmental Management System
GIS	Geographic Information System
HWCS	Hazardous Waste Classification System
ISO	International Standards Organisation
MDB	Municipal Demarcation Board
RSA	Republic of South Africa
SABS	South African Bureau of Standards
SHE	Safety, Health and Environmental System
UNCED	United Nations Conference on the Environment and Development
US	University of Stellenbosch
USEPA	United States Environmental Protection Agency
USRPS	University of Stellenbosch Risk and Protection Services
WPIPWM	White Paper on Integrated Pollution and Waste Management: A Policy on Pollution Prevention, Waste Minimisation, Impact Management and Remediation

CHAPTER 1: RESEARCHING WASTE AT THE UNIVERSITY OF STELLENBOSCH

The generation of waste is by far not an activity restricted to humans. It is a natural one, and one on which nature itself is dependent. It is however the rate of generation that sets humans apart from this natural process. The rapid conversion rates, the considerable volume generated, the non-usable and dangerous nature of wastes generated by humans are the key aspects that set humans apart from other species (Lukey, Albertyn & Coetzee 1991). However, blessed (or cursed) with an intellect that too sets humans apart from other species, humans have recognised the dangers and threats posed by their continuous existence and practices on this fragile planet called “Earth”.

In response to the concerns about waste, numerous methods, techniques and systems have been developed to handle the generation, storage, collection and disposal of waste. Although primitive, the use of the Earth as a “waste-sink” still remains the most common method of disposing of wastes. This end of cycle approach is however no longer being accepted as the “finale” in the story of waste. The growth of general environmentalism, increasing awareness of the inherent risks posed by wastes and their generating, storage, collection and disposal processes, improved communication and information sharing and the realisation that resources are finite has resulted in a revised approach to waste management practices. No longer is disposal seen as the only aspect of the waste cycle that requires attention. All aspects of this cycle are to be considered in relation to the concept of sustainability.

The concept of sustainability, mooted in the 1980’s in response to concerns related to the environment, economic development and the quality of life, was formalised by the Brundlandt/World Commission on Environment and Development in its 1987 report entitled “Our Common Future” (World Commission on Environment and Development 1987). This Commission, convened at the time under the auspices of the United Nations, was aimed at addressing the widespread concerns related to environmental sustainability. It presented numerous objectives to achieve sustainability including the conservation and enhancement of the resource base, re-orientating technology and managing risk (Soussan 1992). Although formulated more

than a decade ago, the concepts, goals, objectives and ideas espoused by this Commission, are still relevant and applicable today. Its principles are included and manifested in various environmental management approaches, including the integrated approach to waste management, waste minimisation, waste prevention and pollution prevention.

The problem of waste is a global one. It is symptomatic of the consumeristic lifestyle that predominates world society today, and in many instances its management techniques display the “out-of-site, out-of-mind” mentality that prevailed during the heydays of the industrial revolution (Postel 1987). Global urbanisation trends present a challenge to human society as resources, including those required for waste disposal, diminish. New approaches to waste management thus dominate the scene both globally and locally and it is in response to these approaches, that this study was undertaken. The global response to environmental management problems has been encapsulated in the “Agenda 21” initiative, whereby significant responsibilities are placed at local or community levels. This initiative thus epitomises the now infamous environmental euphemism of “think globally, act locally”.

1.1 WASTE AS A RESEARCH PROBLEM

Wastes generally present a problem if not managed and handled in an environmentally acceptable manner. There exists a limited understanding as to what constitutes waste and a significant lack of understanding of the waste cycle. This is exacerbated by the fact that waste is regarded as an instantaneous issue. The issue of waste is dealt with at that instant in time when it is disposed of into some or other waste collection point, usually a refuse bin of some sort, to be disposed of in a manner deemed fit by the collecting party. Furthermore, the issue of waste has progressed beyond the scope of the generator, as unbeknown to the majority of generators other role-players, processes and systems are also involved. Waste is only of concern to the ordinary citizen when and where it is produced. These hidden realities of waste handling, storage, treatment and disposal are easily ignored and overlooked by the majority of citizens or generators – the result of this instantaneous phenomenon.

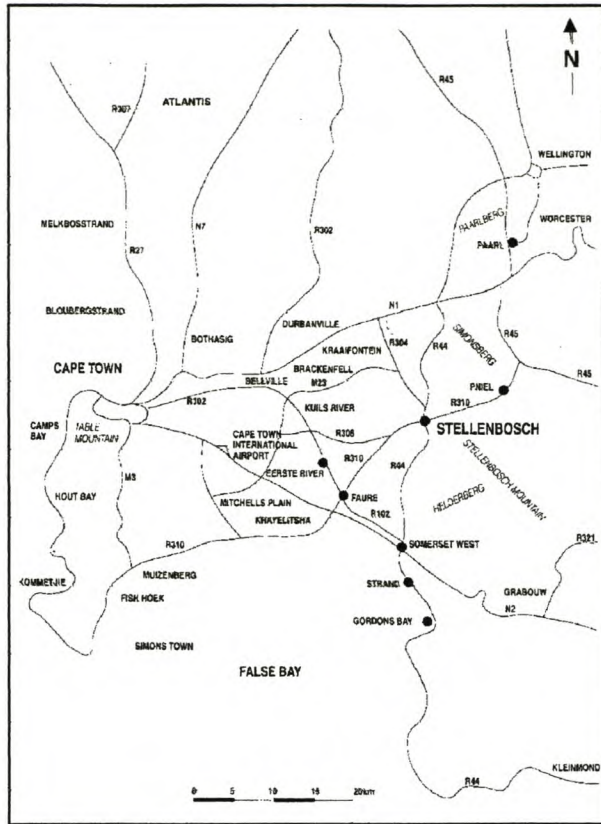
Another reality however exists and to this end, it is the purpose of this study to investigate the cycle of waste at a particular community level, namely at the level of a

tertiary education institution in South Africa. This study involves identifying the types of waste generated, where such wastes are generated, how they are classified, stored, handled, treated and disposed of. Additionally, the overall waste management practices, practiced at this institution are assessed in relation to contemporary environmental management practices and trends in environmental waste management.

1.2 THE UNIVERSITY OF STELLENBOSCH AS A STUDY AREA

The University of Stellenbosch (US), situated primarily in the town of Stellenbosch in the Western Cape, South Africa (Figure 1.1), was chosen as the preferred site for undertaking this research. Its choice was influenced by four factors:

- i) The researcher is currently registered at this institution.
- ii) The research supervisor has vested interests in this institution, being an academic at the institution and being involved in the inter-disciplinary field of environmental management.
- iii) The US has recently undergone a strategic planning exercise as it enters the new millennium. This is attributed to the worldwide changes in university environments and compounded by the contextual realities tertiary institutions in South Africa are faced with (US 1999). Effective resource use has been identified as a strategic priority.
- iv) The US, is a major part of the town of Stellenbosch in the Western Cape, South Africa (Figure 1.2). Stellenbosch has an estimated population of about 60,000 (DMB 2000). In comparison, the US has 18677 contact students registered for tuition at the Stellenbosch campus in 2001 (US 2001a). Figures on the number of personnel employed by the US was unavailable at the time of preparing this report due changes to the human resource information management system (US 2001b). 359 divisions operate at the US (US 2001c), although many of these are sub-divisions of larger divisions. The US therefore contributes and impacts significantly on Stellenbosch and subsequently its environmental performance. Its intertwined status with Stellenbosch does however provide limitations to this study. It is merely a component of the town requiring services similar to that expected from any other municipal ratepayer. The town's public utility functions thus service the US in a manner similar to that received by the other recipients of such services in Stellenbosch.



Source: US (201c)

Figure 1.1 Location map of Stellenbosch



Source: US (201c)

Figure 1.2 The University of Stellenbosch campus

1.3 STUDY AIM

Based on the problematic nature of waste, the aim of this study is thus to provide a delimited snapshot or situational assessment of the current waste cycle and waste management practices occurring at the US. The study is delimited because it is neither exhaustive nor intensive. It is not exhaustive because of the vast geographical extent of the US. Its activities are not only restricted to the town of Stellenbosch as it operates facilities and practices beyond the Stellenbosch town boundary. It is not intensive as it does not investigate each and every aspect of the waste cycle but rather aims to obtain an overall assessment of waste management practices operating at the US. The study does not attempt to obtain a detailed technical perspective of waste management. Rather, it attempts to obtain an environmental management perspective of waste management. It is not undertaken in isolation as it aims to establish the context within which waste, environmental management and the US finds itself. In this regard, the academic merits, the legal framework and the institutional context within which such a study occurs are addressed.

1.4 RESEARCH METHODOLOGY

Parsons & Knight (1995) refer to descriptive or narrative type research as those in which a situation is described. This study, being similar in type, utilises the descriptive data provided by respondents to compile a composite description of waste management practices at the US. Being descriptive in nature and owing to the lack of quantitative data gathered, no rigorous statistical analysis has been performed. An assessment of the available quantitative information is however included.

Prior to undertaking the study a situational assessment of the waste management practices at the US was undertaken. This assessment comprised mainly of conducting interviews and discussions with identified US authorities and was aimed at gathering available information on waste management practices from an environmental management perspective. Additionally, this exercise provided for the identification of other relevant parties involved in waste management at the US. This proved to be invaluable as it resulted in approval and endorsement of the research exercise from the relevant authority charged with managing hazardous waste matters at the US, namely the University of Stellenbosch Risk and Protection Services (USRPS), as well

as from senior US management via the Vice-Rector: Operations, albeit with certain limitations.

1.5 DATA COLLECTION

To achieve the aims of this study, both primary and secondary data sources were used. Data was collected from a variety of sources with a variety of techniques being employed to obtain the required information.

1.5.1 Primary data collection

Primary data was collected using a questionnaire and via interviews.

1.5.1.1 The questionnaire

Administering a questionnaire (included in Appendix A) that elicited information in a predetermined manner yielded descriptive data. The design and format of the questionnaire was aimed at addressing the environmental aspects of the current waste management practices at the US and elicited information on the following:

- waste types;
- status of the waste;
- quantities generated;
- generating processes;
- waste storage facilities;
- waste removal and disposal;
- waste minimisation and recovery.

The use of questionnaire as a survey technique was chosen because of the large number of divisions operating at the US. The large number presented a logistical problem to obtaining an assessment of waste management practices. This survey technique was also chosen because of the wide variety and diversified scope of these divisions and thus to facilitate the assessment their waste management practices, the questionnaire served as a standardisation instrument. The use of the questionnaire mitigated time constraints and allowed for other techniques such as interviews to be utilised as well.

The questionnaire was circulated to divisions identified with the aid of information provided by the USRPS – who currently co-ordinates the removal of hazardous waste.

To manage this co-ordination, as part of its budgeting process, the USRPS undertook a survey to determine the frequency of hazardous waste removal. However, the USRPS information lacked information on non-hazardous waste since it focussed only on hazardous waste. Therefore, to obtain the assessment required, additional divisions that were representative of the activities occur at the US and that generate non-hazardous wastes were chosen to be surveyed. The questionnaire was circulated to 28 divisions in total, as indicated in Table 1.1, using the internal mailing system, the e-mail service via US's Intranet facilities and where requested, personal mail drops were performed. Telephonic and electronic follow-ups were performed to address queries and issue reminder notices. Completed questionnaires were received via the mechanisms engaged during distribution. Twenty-one completed questionnaires were received. Divisions that did not respond are likewise indicated in Table 1.1.

1.5.1.2 Interviews

Due to the various management structures and activities that exist at the US, the result of the different operational requirements of the various divisions, interviews were held with departmental/building assistants, within whose ambit waste collection and disposal generally rests. Thirteen interviews were held at a variety of divisions that undertake a variety of activities and that generate a variety of wastes. This included interviewing the assistants at two US residences. The divisions interviewed are likewise, indicated in Table 1.1. Interviews thus served to complement the data acquired via the questionnaires and were aimed at eliciting the following aspects of waste management at the US:

- types of waste produced;
- quantities generated;
- how waste is disposed of;
- what recycling occurs and how much;
- suggestions for improved management.

The interviews allowed the researcher to obtain those issues not reflected in the questionnaires while interviewees were also allowed to freely express their opinion on waste management practices, an opportunity not often available to them.

Table 1.1 Data sources and surveyed divisions

	<i>Division</i>	<i>Building</i>	<i>Main Activity</i>	<i>Data Sources</i>			
				<i>USRPS Data</i>	<i>Questionnaire</i>	<i>Interview</i>	<i>No Response Received</i>
1	Agricultural Sciences: Office of the Dean	JS Marais	Administrative Support Services	✓	✓		
2	Agronomy & Pastures	Welgevallen Experimental Farm	Education and research	✓	✓		
3	Arts Faculty	Arts Building	Education and research			✓	
4	Biochemistry	JC Smuts	Education and research	✓	✓		✓
5	Botany	Natural Sciences	Education and research	✓	✓		
6	Chemistry	Chemistry	Education and research	✓	✓	✓	
7	Chemical Engineering	Chemical Engineering	Education and research	✓	✓		
8	Chemistry – First Years	De Beers	Education and research	✓	✓	✓	
9	Chemistry – Inorganic	Inorganic Chemistry	Education and research	✓	✓	✓	
10	Consumer Science: Foods, Clothing & Housing	Consumer Science	Education and research		✓		✓
11	Eendrag Men’s Residence	Eendrag	Residential			✓	
12	Entomology & Nematology	JS Marais	Education and research	✓	✓		
13	Fine Arts	Graphic Art	Education and research			✓	
14	Food Science	Food Science	Education and research	✓	✓		
15	Forestry Science	PO Sauer	Education and research	✓	✓		

Table 1.1 Data sources and surveyed divisions (continued)

16	Genetics	JC Smuts	Education and research	✓	✓		
17	Geography & Environmental Studies	Natural Sciences	Education and research			✓	
18	Geology	Chamber of Mines	Education and research		✓		✓
19	Horticultural Science	AI Perold	Education and research	✓	✓		
20	Human and Animal Physiology	JC Smuts	Education and research		✓		✓
21	Industrial Psychology	Industrial Psychology	Education and research			✓	
22	JS Gericke Library	JS Gericke	Education Support Services		✓		
23	Mathematics	Van der Sterr	Education and research			✓	
24	Microbiology	JC Smuts	Education and research	✓	✓		
25	Nature Conservation	PO Sauer	Education and research		✓		✓
26	Nemesia Women's Residence	Nemesia	Residential			✓	
27	Physics	Merensky	Education and research	✓	✓		
28	Plantpathology	JS Marais	Education and research	✓	✓		
29	Polymer Science, Institute of	Polymer Science	Education and research	✓	✓		
30	Psychology	RW Wilcocks	Education and research			✓	
31	Soil Science	JH Neethling	Education and research	✓	✓		✓
32	Student Health Services	SHS – 7 Claassens Street	Medical Services	✓	✓		
33	US Administration	Administration Blocks A, B, C	Administrative Support Services			✓	
34	US Printer	US Printer	Education Support Services			✓	
35	Veterinary Science	AI Perold	Education and research		✓		✓
36	Wine Biotechnology, Institute of	JH Neethling	Education and research	✓	✓		
37	Wood Science	PO Sauer	Education and research		✓		
38	Zoology	Natural Sciences	Education and research	✓	✓		

1.5.1.3 Observations

While collecting the questionnaires and undertaking the interviews, the researcher was afforded the opportunity to observe waste practices at the US. Such observations were captured photographically and utilised for clarification purposes in the preparation of this report.

1.5.2 Secondary data collection

Secondary data collected comprised of an assessment of those records and inventories compiled by other parties involved in waste management at the US. This comprised an assessment of the USRPS-survey reports undertaken by the two appointed waste collection contractors (viz. Waste-tech and SanuMed), for the purpose of classifying and costing the waste removal requirements of the US. This information provided for a description and verification of the hazardous waste produced and collected at the US. This study does not address the economics of waste management practices and hence such detailed analyses were not performed.

1.6 CONTEXTUAL REVIEW OF WASTE, REGULATORY AND ENVIRONMENTAL ISSUES

To underpin the relevance of the waste issues at universities, a contextual review of the subject within its theoretical/academic, institutional and regulatory framework was undertaken.

Within the theoretical/academic framework, the overarching environmental focus of the issue is discussed while waste is reviewed in its context as a hazard and risk issue. International trends, treaties and conventions relating to the topic of universities and wastes were researched for inclusion in the study where appropriate and applicable in terms of the institutional context. In determining the regulatory framework, a review of the laws and policies applicable within the Republic of South Africa and which governs waste practices was undertaken.

The application of contemporary environmental management approaches such as environmental management systems has also been assessed for applicability. These approaches are aimed at addressing the environmental considerations of activities and operations.

1.7 REPORT STRUCTURE

Chapter one deals with the introduction of the topic, the research methodology, study approach and structure followed to achieve the aims of the study.

Chapter two deals with the issue of waste in a theoretical context and is based on the inherent dangers that characterise waste management. Emanating from this, the chapter further explores the legal and regulatory framework that governs waste management practices in the Republic of South Africa. Various laws, regulations, standards and contemporary government policies are discussed that relate specifically to the waste in South Africa. Not restricting the issue of waste to that of theory and law, the study addresses the issue of waste in an institutional context. Within this context, self-regulatory mechanisms, treaties and conventions that have been developed relating specifically to waste, environmental management and universities are assessed. This assessment portrays the global significance and relevance of the issues and subject being researched.

Chapter three concentrates on the empirical findings of the study and discusses the current waste management practices at the US, based on the assessment and synthesis of primary and secondary data collected during the study. A composite assessment and description of waste management practices at the US is deduced.

Chapter four addresses the issue of environmental management mechanisms, particularly the applicability of environmental management systems. The International Standards Organisation 14000 Environmental Management Series approach as an option for integrating waste and environmental management systems is assessed.

Chapter five summarises the research findings and presents future research topics.

Figure 1.3 graphically illustrates the research methodology and report structure.

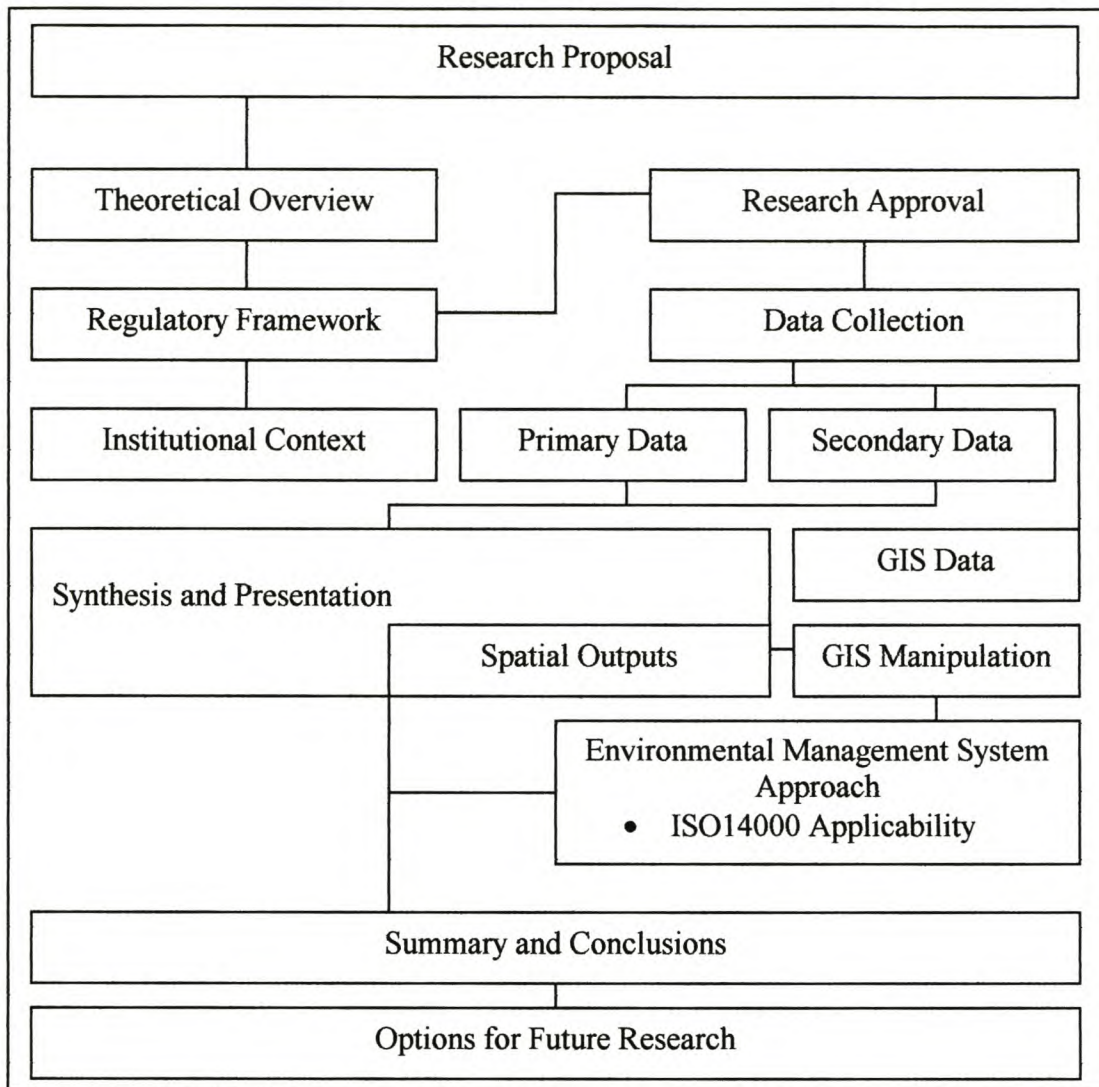


Figure 1.3 An overview of the research structure and report

1.8 SPATIALLY EXPLICIT OUTPUTS

Being a study undertaken under the auspices of the Department of Geography and Environmental Studies (DGES), spatially explicit outputs and relationships are expected. Besides the normal reporting mechanisms of text reports, tables and figures, a desktop Geographic Information System (GIS) in the form of *ArcView* (ESRI 1996), was utilised to generate spatially explicit outputs (i.e. maps). These maps display the spatial relationships evident from this study.

Baseline spatial data was obtained from the US Physical Planning Department in the form of an *AutoCAD* coverage. This coverage was imported into *ArcView* using its data exchange functionalities and maps were generated.

1.9 REPORTING CONVENTIONS USED IN THIS STUDY

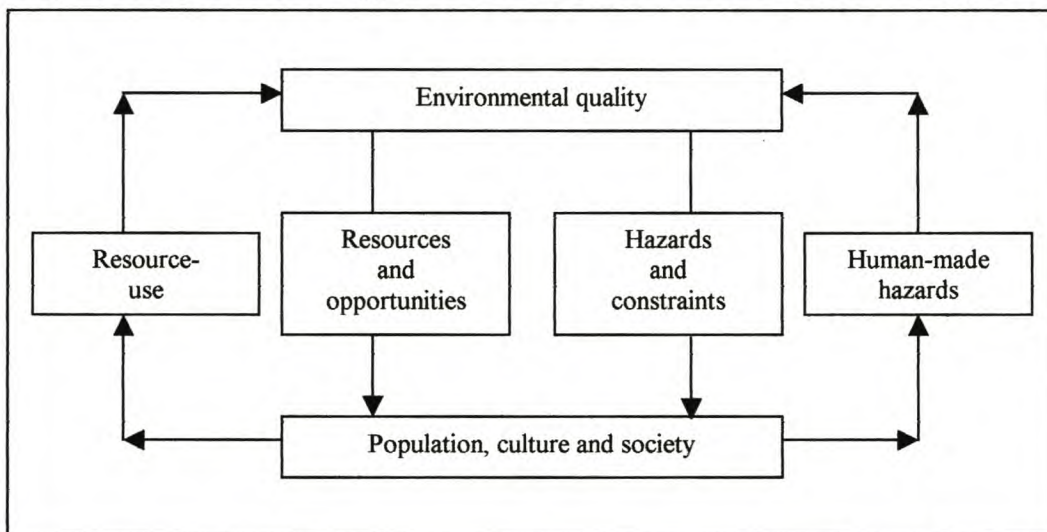
While complying with the prescribed reporting conventions required by the DGES the report nonetheless required the implementation of additional reporting conventions. The additional conventions were adopted as a result of the potential public display of the final report and the sensitive nature of the study. In addition, certain conventions have been adopted at the request of numerous respondents. Thus, in consultation and with approval of the study leader, the following conventions have been accepted:

- i) **Anonymity** - no reference is made to the names of the respondents or those interviewed. This is insofar as the study pertains to the US-based component of the study. Where external communication has been undertaken, they are recorded and referenced according to the prescribed DGES guidelines.
- ii) **Use of language** – where statements were quoted in Afrikaans, these were transcribed directly into the text without any translation, so as not to lose any significance.
- iii) **Within the US**, a vast number of entities such as faculties, departments, institutes, units, centres, residences and services operate. These are referred to as divisions in accordance with the terminology quoted by the US (2001d).

CHAPTER 2: WASTED CONCERNS OR CONCERNED ABOUT WASTE

2.1 ENVIRONMENTS OF CONCERN: THE HUMAN-ENVIRONMENT RELATIONSHIP

A constant interaction between humans and the environment exists. The resources offered by the environment as well as the space afforded to humans by the environment is exploited in the quest to survive, thrive and pursue development. Constraints however exist resulting from the hazardous nature of this relationship and the inherent hazards that exist within the environment. Park (1983) describes this relationship as a “*symbiosis*” or a two-way association based on opportunities and constraints as illustrated in Figure 2.1.



Source: Park (1983:5)

Figure 2.1 The human-environment symbiosis (adapted)

This symbiotic relationship is elastic in nature, dependent on a myriad of factors that differs in strengths and weaknesses. The product of this interaction is the satisfaction of basic human needs, alternatively the satisfaction of humankind's economic, social and political aspirations. The level of interaction with the environment or the stresses of human development pressures on the environment represents a current discourse that warrants a high degree of research and active management. In this regard contemporary environmental management is directed at the management of those aspects of the environment over which humans exert a tangible influence in order to achieve an acceptable level of (sustainable) development practices. Goudie (1993) amplifies the levels of uncertainty that exist when considering the environment, attributing it to a variety of factors including the complexity of natural systems, non-linear responses to

change, the existence of thresholds, imperfect interpretation, models and modelling techniques and the risk of natural catastrophes. While it is proposed that further research be undertaken to reduce these uncertainties, Kennedy (1993) calls for a redefinition of the academic techniques, technology and tools used to research these phenomena. While the above may be academically focussed on a pragmatic level, managing the interface of the human-environment relationship reduces uncertainty.

2.1.1 Human-environment relationships – A geographical perspective

The classical geographical paradigms centred on human-environment relationships. Simplistically stated, the paradigm of environmental determinism referred to the paradigm whereby human relations were governed or determined by the surrounding dominating physical environment. Environmental possibilism referred to the paradigm whereby the environment offered possibilities for human interaction and thus the environment influenced human development. The regional paradigm exemplified this interaction by virtue of its strong descriptive foci albeit on regional or local levels. The development of systematic paradigms, quantitative analysis, explanation-bound generalisations and sub-disciplinary specialisms, similarly, typified the human-environment relationship. Other paradigms “humanised” these relationship extracting it from the pure sciences and adding to it a qualitative dimension. The contemporary developments include an “applied” approach, integrating the human and physical disciplinary foci to address the concerns of pressing environmental problems (Jones 1983). Vogel (1992) refers to this as an integrated approach.

The paradigms of the discipline of geography have thus undergone a cycle from environmental description to environmental management and it is within this new applied and integrated environmental and geographical approach that issues such as waste management is considered.

2.1.2 Pollution and waste as an environmental issue

The relationship between humans and the environment occurs multi-dimensionally, occurring in both space and time. Complications and complexities result not only from this multidimensional state, but also from the interaction over various media including those of air, land and water. Humans have to varying degrees impacted on these environmental media. Pollution and waste represent the most explicit form of this environmental impact and therefore requires management.

Pollution is defined in the White Paper on Integrated Pollution and Waste Management for South Africa (RSA 2000a: 58) (WPIPWM) as being:

“... any change in the environment caused by substances, radioactive or other waves, noise, odours, dust or heat from any activity, including the storage or treatment of waste or substance, construction and the provisions or services, ..., where that change has an adverse effect on human health or well-being or on the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have such effect in the future”.

While the causes and effects of pollution are varying, the generation of waste by humans probably represents the most tangible and explicit cause of pollution. According to the WPIPWM (RSA 2000a: 59) waste is defined as:

“...an undesirable or superfluous by-product, emission, or residue of any process or activity which has been discarded, accumulated or been stored for the purpose of discarding or processing. It may be gaseous, liquid or solid or any combination thereof and may originate from a residential, commercial or industrial area. This definition includes industrial wastewater, sewage, radioactive substances, mining, metallurgical and power generation waste”.

2.1.3 Waste generation

As an inevitable consequence of the natural-biological survival processes, all species generate waste to exist. Humans however, compound this generation capacity as a result of the wide-spread use and transformation of resources required not only to survive, but also as a result of their ancillary activities. Resource consumption to satisfy developmental, material, educational and technological needs of human society have resulted in a wide variety of waste types – hazardous and non-hazardous, solid, liquid and gaseous – being generated, and in significant quantities. This is exacerbated by the concentration of large numbers of people (and other organisms) and their waste generating activities over relatively small portions of land. Lukey, Albertyn & Coetzee (1991) in their analysis of South Africa’s waste problem clarify the role that humans play in the inevitable waste generation cycle. According to this analysis the human species is set apart from other species in that the waste that it generates represents not only a threat to itself, but it also endangers and represents a threat to the rest of the natural world.

2.1.4 Waste as a hazard and risk

The process of urbanisation, densification and intensification of services, primarily the result of the concentration of the provision of services and opportunities requires in the case of waste management, a specialised management approach because of the inherent hazardous properties of waste. Significant environmental health hazards and risks are associated with pollution and waste. Wastes therefore represent a significant threat to the environment and sustainable development.

Park's (1983) classification and definition of hazards utilises a causal approach based on the extent to which a hazard is natural or human-made. Based on this approach three types of hazards are classified, namely:

- i) *Natural hazards* – that arise purely as a result of natural processes such as earthquakes and floods. These occur irrespective of the presence of humans.
- ii) *Quasi-natural hazards* – that arises as a result of the interaction of natural processes and human-induced changes to the environment. Smog and desertification are examples of such hazards.
- iii) *Human-induced hazards* – that arises primarily as a result of human activities. Pollution or the accidental release of harmful substances and waste are examples of such hazards.

Management frameworks have evolved to reduce the threats of these hazards and risks that may occur. These operate within the legislative/regulatory context, in a self-regulatory context or in an institutional context.

2.2 THE REGULATORY FRAMEWORK

The inherent risks and hazardous nature of waste requires it to be regulated by law. In South Africa, as in other countries, there exists a plethora of legislation regulating wastes. Not only does this legislation cover environmental issues, but it also covers health and labour issues.

2.2.1 White Paper on Integrated Pollution and Waste Management

The White Paper on Integrated Pollution and Waste Management: A Policy on pollution prevention, waste minimisation, impact management and remediation (RSA 2000a)

reflects the South African government's current policy on pollution and waste. Of significance, is the paradigm shift to prevention and minimisation rather than "end-of-pipe" treatment and disposal solutions while recognising the multi-sectoral role that all sectors of society have to play in the waste-cycle. The policy is to be implemented via a National Waste Management Strategy (RSA 2000b).

Applicable to all sectors of society, it promotes the management of waste in a holistic and integrated manner that encompasses the entire waste cycle (i.e. from generation, storage, collection, transportation, treatment and final disposal – commonly referred to as the "cradle-to-grave" approach). This policy has seven interdependent strategic goals. These include:

Goal 1: Effective institutional framework and legislation – this entails the creation, development, maintenance and continuous improvement of an effective and adequate legislative and institutional frameworks. Via these frameworks will:

- standards and criteria on environmental quality be developed;
- mechanisms ensuring the safe transport of raw materials, products and wastes be developed so as to prevent accidents and spills, hence ensuring that such events will not have adverse affects on the environment and public health;
- regulations, standards and quotas be developed to regulate the waste generation cycle, thus ensuring waste minimisation;
- regulations to enforce a coordinated and integrated approach to waste management planning, thus ensuring the promotion of waste minimisation, recycling and cleaner production technologies/methodologies;
- standards for waste collection systems be developed;
- standards for the safe management of medical waste be developed;
- standards for pollution and waste management systems including monitoring, auditing and reporting systems be developed;
- alternative mechanisms such as voluntary agreements, economic and financial instruments be assessed to achieve the objectives of the policy,
- the legal instruments as described above be devolved to appropriate spheres of government.

Goal 2: Pollution prevention, waste minimisation, impact management and remediation – this entails promoting holistic and integrated pollution and waste management addressing

the impact, management, prevention, reduction, control and remediation of pollution and waste on water, air and land/soil environments. Additional objectives include:

- achieving pollution prevention, waste avoidance and minimisation by promoting mechanisms that adhere to appropriately designed parameters, optimal operating procedures and effective housekeeping for waste-generating processes;
- resource recovery, recycling and reuse mechanisms such as an economic environment that favours recycling materials and hence reduces the waste stream;
- mechanisms ensuring that all South Africans have access to collection services, that wastes are appropriately treated and processed before their disposal in accordance with the relevant laws, regulations, standards and guidelines and that pollutants released during the waste treatment process are rendered harmless;
- developing environmentally and socially acceptable waste disposal techniques and facilities;
- ensuring that accountable parties pay for the remediation of accidents and environmental destruction as a result of pollution or unacceptable waste management practices;
- giving effect to the international conventions and treaties of which South Africa is a signatory (e.g. Lomé and Basel Conventions), as well as the investigating of others (e.g. Bamako Convention).

Goal 3: Holistic and integrated planning – which ensures that integrated pollution and waste management considerations are effectively integrated into government policies, programmes and strategies, spatial development plans as well as all economic activities. This also entails the development of guidelines for integrated waste management plans for general, hazardous and industrial waste.

Goal 4: Participation and partnerships in integrated pollution and waste management – whereby enabling mechanisms and processes are developed to ensure effective public participation and community involvement in integrated pollution and waste management governance and sustainable development, including the establishment of monitoring committees.

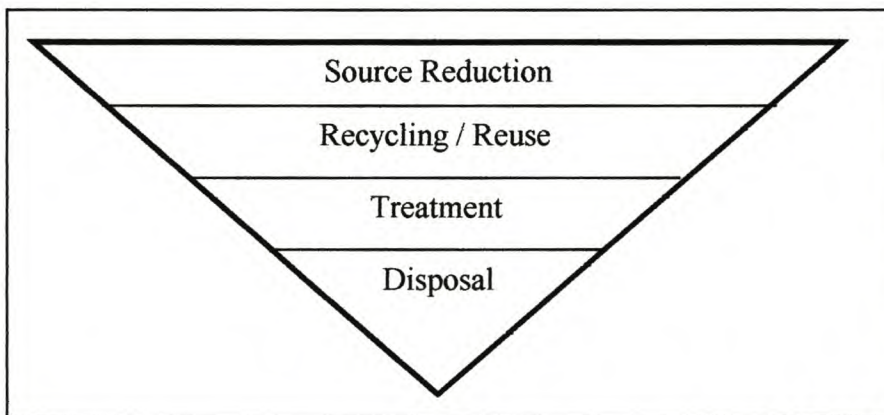
Goal 5: Empowerment and education in integrated pollution and waste management – that entails the promotion and increased awareness of such matters while developing knowledge, skills, values and commitment required to achieve the goals and objectives of the policy.

Goal 6: Information management – that entails the development and maintenance of effective information management systems and databases that support the goals and objectives of the policy. This goal includes the registration of waste generators, handlers, treatment facilities and disposers. The collection, analysis and dissemination of derived data and statistics will enable the monitoring and evaluation of the policy.

Goal 7: International co-operation – to ensure that South Africa effectively deals with national and international issues affecting pollution and waste management.

The principles contained in this policy reflect an integrated approach towards the management of waste and pollution in South Africa. The “cradle-to-grave” approach ensures that *all* role-players are involved in the management of waste and pollution. It represents a significant shift from the “end-of-pipe” paradigm by adopting the waste-minimisation approach. The inclusion of the information systems component ensures that role-players involved in waste and pollution matters are recorded and monitored.

The “minimisation” approach of the WPIPWM, as Figure 2.2 demonstrates, is based on the adoption of an internationally accepted hierarchical and systematic environmental management approach for managing waste.



Source: USEPA (2000: 11)

Figure 2.2 The waste management hierarchy

The emphasis is on preventing pollution through source reduction and reuse techniques. Such techniques employed at source may include recycling and eliminates the need for off-site recycling, treatment and/or disposal. It reduces transportation demands. This approach is typically less expensive than collecting, treating, and disposing of waste and represents much less of a risk to the environment. Via this approach raw material use,

solid waste and hazardous waste generation, inventory losses, spills and accidental releases, energy usage and water consumption are reduced (USEPA 2000).

Common source reduction techniques are provided in Table 2.1 and include process efficiency improvements, material substitution, inventory control, preventative maintenance, improved housekeeping and in-process recycling.

Table 2.1 Source reduction techniques

<i>Source reduction technique</i>	<i>Description</i>	<i>Examples</i>
Process efficiency improvements	A method of doing more with less by designing new systems or modifying existing ones; the effective means of conserving materials and resources.	Centralised fluid distribution systems, water flow restrictors, energy saving light fixtures.
Material substitution	Replace hazardous chemicals with less toxic alternatives of equal performance.	Using water based paints instead of solvent-based paints; replacing solvent degreasers with aqueous cleaning systems.
Inventory control	Reduce product losses due to product expiration and overstocking.	Restricting access to supply areas; maintaining accurate inventory records to prevent over-stocking.
Preventative maintenance	Includes any activity that might prevent equipment malfunctions and environmental releases.	Routinely inspecting equipment and storage containers, fixing problems immediately, following standard operating procedures.
Improved housekeeping	Keeping a clean shop conserves resources and materials, prevents product losses, spills and leaks.	Keeping aisles clear, cleaning up spills and absorbents immediately, maintaining storage shelves in good order
In-process recycling	In-process recycling is considered source reduction if materials are not removed from the process (i.e. waste is not generated) or if materials are redirected back into the process	Water re-circulation, multi-pass coolant systems.

Source: USEPA (2000: 12)

2.2.2 The National Waste Management Strategy

To give effect to the policy described in Section 2.2.1, the National Waste Management Strategy (RSA 2000b) has been devised and comprise of the following elements:

- integrated waste management planning, waste information systems,
- waste collection and transportation,
- waste minimisation and recycling,
- waste treatment and disposal, and
- capacity building, education, awareness and communication.

These elements are aligned with the objectives and principles of the WPIPWM, being the action-oriented translation of these principles and objectives into an outcomes-based, time-bound programme of implementation.

2.2.3 The South African Constitution (Act No. 108 of 1996)

Contained within the Constitution of South Africa (RSA 1996) (Constitution) is a 'Bill of Rights' that enshrines an environmental right for all the people of South Africa. Section 24 of the Constitution states that everyone has the right to:

- i) an environment that is not harmful to their health or well-being; and
- ii) have the environment protected, for the benefit of present and future generations, through reasonable legislative and other ways that:
 - prevent pollution and ecological degradation,
 - promote conservation,
 - secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

Supplemental to this environmental right is the "right to know" contained in section 32 of the constitution. In terms of this right, everyone has the right of access to:

- any information held by the state; and
- any information that is held by another person and that is required for the exercise or protection of any rights.

This right has been translated into national legislation in the form of the Promotion of Access to Information Act (Act No. 2 of 2000) (RSA 2000c). In terms of this legislation, anyone may exercise the rights afforded to them in terms of this legislation and may therefore request information from any natural or legal person. Entities are therefore required to maintain accurate records and procedures. Limitations on the request for information do however exist.

From an environmental perspective, this legislation together with the public nature of environmental matters will require entities to maintain accurate records of their environmental performance. Interested and affected parties may request entities to provide information on their environmental performance, impacts, aspects and practices

when exercising their environmental rights. Should entities contravene the requirements of this legislation they may be liable for fines, penalties and prosecution.

2.2.4 The National Environmental Management Act (No. 107 of 1998)

The principles contained in this legislation (RSA 1998a) are broad and relate in varying degrees to the issues of wastes and pollution. The following are significant for the purpose of this study:

- Development must be socially, environmentally and economically sustainable;
- Sustainable development requires that pollution and degradation of the environment are avoided, or where they cannot be avoided, are minimised and remedied;
- Waste is avoided; or where it cannot altogether be avoided, minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner;
- A risk-averse and cautious approach is applied;
- Responsibility for the environmental health and safety consequences of a policy, programme, project, process, service, or activity exists throughout its life cycle;
- The right of workers to refuse work that is harmful to human health or the environment and to be informed of dangers must be respected and protected;
- The costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment (i.e. the “polluter-pays principle”).

2.2.5 The Environment Conservation Act (No. 73 of 1989)

Regulations promulgated in terms of this legislation (RSA 1989) compels the undertaking of an environmental assessment for certain listed activities including the construction and upgrading of transportation routes, structures, manufacturing, handling and/or processing facilities for any substance that is dangerous, hazardous and controlled by other national legislation. This includes a list of scheduled processes, identified in terms of the Atmospheric Pollution Prevention Act (Act No. 45 of 1965) (RSA 1965).

Waste is conditionally defined in terms of this legislation “...as an undesirable or superfluous by-product, emission, residue or remainder of any process or activity, any matter, gaseous, liquid or solid or any combination there, originating from residential, commercial or industrial area” (RSA 1990). Section 20 of this legislation governs the

establishment, provision or operation of waste disposal sites and the types of wastes disposed of at such sites. In this regard, the Department of Water Affairs and Forestry (DWAF) – as the lead agency in South Africa responsible for the implementation of this section of the law – developed a waste management series that deals with *inter alia* the minimum requirements for the handling, classification and disposal of hazardous waste (DWAF 1998).

2.2.6 The National Water Act (No. 36 of 1998)

This legislation (RSA 1998b) deals with the pollution prevention and the control of incidents that are likely to result in pollution and have a detrimental effect on water resources. It too entrenches the “polluter-pays principle”.

2.2.7 The Atmospheric Pollution Prevention Act (No. 45 of 1965)

This legislation (RSA 1965) regulates the emission of dust, smoke, gases and other substances into the atmosphere. It permits the operation of incinerators handling medical wastes, pharmaceutical wastes and low-level radioactive wastes.

2.2.8 The National Health Act (No. 63 of 1977)

This legislation (RSA 1977) together with its associated regulations, governs the handling (i.e. classification, sorting, storage) and disposal (including transport) of medical wastes and includes the responsibilities of the generator, the transporter and the disposer. Mandatory compliance applies to conventional health care facilities (e.g. hospitals, clinics, medical/pharmaceutical consultation and rehabilitation facilities), while microbiological and pathological laboratories, and places where biological research is undertaken are subject to the same legislation. Any such facility is to be subjected to this legislation where a health risk exists.

2.2.9 The Hazardous Substances Act (No. 15 of 1973)

This legislation (RSA 1973) broadly covers the classification of hazardous waste substances and controls the disposal, importation and exportation of hazardous wastes.

2.2.10 Occupational Health and Safety Act (No. 85 of 1993)

This legislation (RSA 1993) provides for the health and safety of persons at work and the protection of the broader community from the hazards to their health and safety

associated with this work. Supporting regulations have been issued in terms of this legislation and include:

- Regulations on hazardous chemical substances – that require the classification and categorisation of hazardous chemical substances used (and produced) in activities and processes. These regulations impose information and training obligation on employers on the risks associated with hazardous chemical substances. Monitoring and assessment of both the substances, exposure levels and medical/biological examinations are integral to these regulations. These regulations furthermore, address the labelling, packaging, transportation, storage, and disposal of hazardous chemical substances.
- Major hazard installation regulations – that refers to any installation where any substance is produced, processed, used, handled or stored in a form or quantity that it has the potential to cause a major incident – one that is of catastrophic proportions. The scope of this regulation is similar to that of the hazardous substances regulations requiring primarily a risk assessment of the installation as well as on- and off-site emergency plans.
- General administrative regulations – that require persons who produce, import, sell or supply hazardous chemical substance to provide the receiving party with material safety data sheets (“MSDS”).
- Hazardous biological substances regulations – are yet to be promulgated.

The Department of Labour as the lead agency implementing this legislation has embarked on an awareness campaign promoting the requirements of this legislation. In terms of this campaign, a checklist has been published in the print media. The use and storage of hazardous materials feature in this checklist appended as Appendix B.

2.2.11 The Genetically Modified Organisms Act (No. 15 of 1997)

This legislation is the result of South Africa being a signatory to the Convention on Biodiversity and requires her to comply, adhere and endorse the Protocol on Biosafety. South Africa has legislated the requirements of this protocol. This legislation (RSA 1997) aims to:

- promote the responsible development, production, use and application of genetically modified organisms. It is also intended to ensure that those activities involving such organisms – including their importation, production, release and

distribution – occur in a manner that limits possible harmful consequences to the environment and hence do not present a hazard or threat to the environment.

- establish evaluation and risk assessment techniques and criteria as well as the reduction of risks from activities involving the use and application of genetically modified organisms.
- pay attention to preventing accidents during the use and application of genetically modified organisms and ensuring effective waste management practices.

2.2.12 City of Cape Town's Wastewater and Industrial Effluent By-law

In terms of this legislation (CCT 2001), enacted at a local authority level, discharges into this authority's sewers and stormwater are prohibited provided the scheduled standards are met. This local authority neighbours the town of Stellenbosch. The Faculties of Medical Sciences and Economic and Management Sciences of the US operate research and academic facilities within the City of Cape Town. The US is thus legally obliged to consider and adhere to these standards for its facilities inside this jurisdictional area. A copy of this standard is appended as Appendix C.

2.2.13 Stellenbosch Transitional Local Council: By-law relating to the prevention and suppression of nuisances

This by-law (STLC 1998) is aimed at regulating the deposition and storage of waste and other offensive substances within its jurisdictional area. It is also aimed at regulating the appearance and environmental quality of the town of Stellenbosch, since it describes the type of pollution-generating activities that may not be practiced, while emphasising the responsibility of landowners towards maintaining the aesthetic quality of their land.

2.2.14 The Draft Western Cape Medical Waste Management Act

This draft legislation (Province of the Western Cape 2001) aims to manage and regulate the medical waste stream in the Western Cape. Similar to many of the above, but specific to medical waste in the Western Cape, this act also places a greater responsibility on local authority's to manage this waste stream within their jurisdictional areas. It adopts many of the principles contained in many of the aforementioned pieces of legislation and policies relating specifically to the responsibilities of medical waste generators, the transportation of such wastes including and defining the collection and removal and disposal of medical waste by municipalities. Significantly and similar to the WPIPWM, is the registration of

medical waste generators and transporters. This draft Act also addresses the issue of dumping medical wastes.

2.2.15 Policy on Radioactive Waste Management

The Policy on Radioactive Waste Management (DME 2000a), read in conjunction with the “Status of Radioactive Waste Management in South Africa” (DME 2000b) report, reflects government’s attitudes towards radioactive wastes by virtue of its inherent hazardous nature and public perception. It addresses radioactive waste not only in the light of its perceived traditional generation by nuclear power generation facilities but also by virtue of its generation in other operational processes and procedures such as in research, medical, industrial, commercial, agricultural and defence industries. Endorsing the internationally accepted principles as stipulated by the International Atomic Energy Agency, of which South Africa is a member, the policy includes the following objectives to achieve sustainable development:

- transparency;
- safety and environmental protection;
- appropriate management and minimisation;
- sound decision making based in scientific information, risk analyses and the optimisation of resources;
- caution where uncertainty exists;
- generators must carry the associated financial burden;
- cooperative governance and efficient national coordination.

This policy also addresses the import and export of radioactive wastes stating that unless special justification exist for this, South Africa will neither import nor export such wastes.

The above legislation is a sample of the environmental-related legislation applicable to an institution like that of the US and this study. It is not exhaustive. A comprehensive list of legislation affecting environmental concerns is found in Appendix D.

2.3 INSTITUTIONAL CONTEXT

In the last three decades of the 20th century attempts to address widespread environmental degradation have been observed. These attempts were reactive and proactive, dependent on the type of crises. Various societies and sectors of society have embarked on their own initiatives to address the concerns of population growth, species loss, habitat destruction

and transformation, global warming, pollution and waste management and ultimately, the increasing threat of environmental catastrophes. These initiatives, in the form of policies, tools, systems and concepts are based on the best available knowledge and understanding of the issues. This knowledge and concerns, voiced at both formal and informal conferences and proceedings, in the formal statutory arena are enacted in various laws, conventions, policies and treaties developed and adopted.

The 1972 UN “Conference on the Human Environment” was the first major conference addressing environmental issues. The 1987 Brundlandt Commission report “Our Common Future” (WCED 1987) formally constituted the concept of sustainable development as being the objective of environmental management. It is defined by Soussan (1992: 24) as “...development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. While maintaining the crux of this definition, it has been redefined and adapted to suit the policy requirements of various entities. Subsequent to the 1992 “Conference on the Environment and Development” (“UNCED”) commonly referred to as the “Earth Summit” held in Rio de Janeiro, numerous initiatives were initiated to realise the concept of sustainable development. This included the development of the Agenda 21 programme (UN 1992) and the Local Agenda 21 (ICLEI 1996) initiative in which the implementation and monitoring of sustainable development is entrenched at local levels.

Thus, both locally and internationally, a wide variety of regulations, programmes and standards have been developed to achieve sustainable development and environmental management. These mechanisms have been forthcoming from the various sectors of society, including governments, business and civil society. No longer is corporate and institutional window-dressing in the form of so-called “green-washing” being accepted as an indication of environmental commitment (Rodda 1994). Tangible and auditable mechanisms are required. For the purpose of this study, the frameworks offered by that sector of society concerned with “tertiary” or “higher” education are addressed.

2.4 Universities and sustainability

Not immune and excluded from the need for an institutional framework to manage its environmental responsibilities, universities have proactively been engaged in trying to establish solutions to the environmental crises and have formally recognised the critical

role that they have to play in managing their impacts on the environment. In this regard numerous declarations and frameworks have been proposed to improve and manage their environmental performance.

2.4.1 Talloires Declaration (1990)

Prior to the 1992 Earth Summit, at a conference held at Talloires (France), university leaders, presidents, rectors and vice-chancellors from all over the world, expressed their concern about the growing rate of environmental degradation and the scale of unprecedented environmental change taking place. At this conference, it was agreed that universities have a role in ensuring adequate levels of sustainability and environmental management. The conference culminated in the signing of the Talloires Declaration (IISD 2001a), a summary of which is appended as Appendix E. Signatories have bound themselves to the following actions and goals:

- i) To raise awareness across all sectors of society of the urgent need to advance towards an environmentally sustainable future;
- ii) To encourage universities to engage in research, education and policy development as well as the exchange of information on issues of population, environment and sustainable development;
- iii) To establish programs to produce expertise in the fields of environmental management, sustainable economic development, population development and other related fields. Also to ensure that graduates are environmentally literate and responsible citizens by creating programs capable of teaching environmental literacy to students and staff;
- iv) To promote, and act as examples of, environmental responsibility by establishing programs of resources conservation, recycling and waste reduction or minimisation.

By December 2000, a total of 279 universities and similar institutions had ratified this Declaration. Seventeen African universities are signatories of which five are from South Africa. The South African signatories are the universities of Cape Town (UCT), Witwatersrand (WITS), Western Cape (UWC), Rhodes University and Natal University (ULSF 2001). A signatory list is appended as Appendix F. Signatory universities have made varying degrees of progress towards the commitments expressed in the Talloires Declaration. Locally, Rhodes University has full time staff employed to develop and implement its environmental policy, appended as Appendix G (RU 2001). The Talloires

Declaration represented the first of numerous other strategies and attempts by universities and tertiary or higher education institutions to support the concept of sustainability. Others that followed include:

2.4.2 Halifax Declaration (1991)

A year after formalising the Talloires Declaration, the International Association of Universities, the United Nations University and the Association of Universities and Colleges of Canada endorsed the environmental commitment required in terms of the Talloires Declaration and proclaimed the Halifax Declaration whereby the challenge for environmentally sustainable development was reinforced (IISD 2001b). The Halifax Declaration addressed the issues of widespread unsustainable environmental practices, the continuing degradation of the environment and the persistent influence of poverty. As with the Talloires Declaration, the Halifax Declaration initiated numerous programs, goals and action plans with impetus given to the UNCED process. Included amongst these was the pro-active role universities were to play at a local or institutional level as well as an action-oriented, practical approach to be adopted by participant institutions. Such initiatives included the celebration of “Earth Days”; the creation of sustainable development implementation units; institutional, public and broad scale environmental literacy and educational activities; the promotion and exchange of research into the environment and development and; an assessment or review of the individual institution’s impacts on the environment. In terms of this assessment, not only were institutions expected to “audit” their actions, but also to adopt a proactive stance to demonstrate sustainable development practices. A copy of this action-oriented approach is appended as Appendix H.

Although the Talloires and Halifax Declarations were both sanctioned before the 1992 Earth Summit the onward march of commitments and pledges proclaiming environmentally responsible behaviour and actions did not stop at this summit. In the subsequent years, additional declarations were proclaimed. These included declarations signed at Swansea and Kyoto, the CRE-Copernicus Charter and student declarations.

2.4.3 The Swansea Declaration (1993)

The 1993, 15th Quinquennial Congress of the Association of Commonwealth Universities, entitled “People and the Environment – Preserving the Balance”, issued the Swansea Declaration. This declaration acknowledged the vital philosophical, research and practical role universities and similar institutions play to achieve sustainable development (IISD 2001c). It requested participant institutions to *inter alia* encourage sustainable

development practices through utilising existing resources and to review their own operations to reflect such practices. A summary of the declaration's text is appended in Appendix I.

2.4.4 The Kyoto Declaration (1993)

Also in 1993, under the auspices of the International Association of Universities, the Kyoto Declaration was formulated, embodying the language and substance of the Halifax Declaration and the Swansea Declaration (IISD 2001d). The objectives of this declaration are appended in Appendix J.

2.4.5 The CRE-Copernicus Charter (1994)

The sub-program COPERNICUS (an acronym for CO-operation Programme in Europe for Research on Nature and Industry through Coordinated University Studies) of the Conference of European Rectors launched the "University Charter for Sustainable Development" in recognition of the UNCED process (IISD 2001e). This charter required universities to address the issues of institutional commitment, environmental ethics, employee education, environmental education, interdisciplinarity, collaborative education and research, knowledge dissemination, networking, partnerships, continuing education programmes and technology transfers that entailed not only educationally significant technologies but also advanced management methods. A summary of this charter is appended as Appendix K.

2.4.6 Student declarations

Under the auspices of the student organisation Community Environmental Educational Development (CEED) the Student Declaration for a Sustainable Future was issued in 1995 (IISD 2001f). This was followed by the Global Student Environmental Charter (1997), representing the concerns of students from 35 countries in recognition of the role students have to play in ensuring sustainable development (Potgieter 1998). Both student charters recognise the essential role students play as future leaders in ensuring the achievement of sustainable development.

2.4.7 The Association of University Leaders for a Sustainable Future

A requirement of the Talloires Declaration was the establishment of a secretariat that would promote its intentions amongst its signatories. In 1992 this secretariat, called the 'Secretariat of University Presidents for a Sustainable Future' was duly inaugurated. . In

1995 however, as a result of redefining their focus the secretariat renamed themselves the ‘Association of University Leaders for a Sustainable Future’ (AULSF 2001b). In 1997 the functions of the secretariat was transferred to the Washington-based ‘Center for Respect of Life and Environment’ (CRLE) from Tufts University where it was originally hosted. CRLE adopted an interdisciplinary and multi-perspective approach that required signatory institutions to implement, where appropriate, structural changes and develop changes in attitudes towards their environment. Institutions seeking membership status are required to report on such commitments. According to AULSF (2001a) prospective institutions are required to present information on:

- i) Whether the institution has an environmental policy,
- ii) What academic courses or programs are offered that reflects environmental/sustainable development,
- iii) What research and development in the field of environment/sustainable development the institution is involved in,
- iv) What institutional environmental operation systems or programs (example recycling) are in operation,
- v) What partnerships and outreach efforts are in operation to address sustainability in the community, institutional neighbourhood and the world.

Appendix L contains the membership application form for the AULSF.

It is on these leading issues that prospective institutions are evaluated for membership and thus it is imperative for prospective institutions to have the above information available for submission. In addition, a “Sustainability Assessment Questionnaire” has been developed (AULSF 2001b) that encapsulates the information required for membership and provides the institution with a sustainability snapshot. The questionnaire is appended as Appendix M.

Pertinent to this study, is the institutional operations and practices component that reveal how, in practice institutions deal with issues of pollution, emissions, environmentally sensitive construction and building activities, energy utilisation, purchasing and procurement, waste management (solid, liquid, hazardous, toxic and radioactive waste), recycling initiatives, transportation, water conservation management, integrated pest management and other issues affecting the sustainability of institutions.

CHAPTER 3: WASTE MANAGEMENT PRACTICES AT THE UNIVERSITY OF STELLENBOSCH

Like most institutions universities generate wastes. The US is no exception and it generates a variety of wastes as a result of the wide variety of activities occurring here. This chapter reports the results of the survey on current waste generation, removal, storage, disposal and minimisation at the US.

3.1 WASTE GENERATING ACTIVITIES AT THE US

Some institutions generate a limited range of waste because of the limited activities and restricted nature of processes being undertaken. Universities typically produce a wide variety of wastes as result of the range of activities that occur. The US, because of the comprehensive range of programmes on offer, long development history and because it is a residential university, engages in a large number of activities. Each activity requires different inputs and generates different types of waste. These activities include a broad spectrum of education and research, administration, accommodation, sport and recreation, agricultural and forestry and various medical service activities.

In the ecological footprint concept as proposed by Rees & Wackernagel (1994), entities emit a sphere of influence extending beyond their defined borders as a result of their resource utilisation or inputs exceeding their available resources. Similarly, entities emit a sphere of influence in terms of waste management, as their waste is disposed of beyond their defined borders. This occurs when a large number of people concentrate within a relatively small area, as in the case of the US. The US has a significant sphere of influence in terms of resource consumption and in terms of waste disposal. In the process of producing graduates and delivering its primary product, namely an educational, training and research service, resources and inputs are consumed and outputs are generated. These outputs are not only graduates but also production wastes. A waste cycle has developed at the US and it is the purpose of this chapter to describe this cycle.

Whereas the traditional approach to waste research would only have ascertained what waste types are produced, this study, espousing new paradigms in environmental management and regulatory authorities, has scoped additional issues related to waste management at the US. These include the characteristics of the waste generated, the

generating processes, the storage, removal and disposal of waste from the US and whether any waste minimisation and recovery practices occur here.

3.2 CLASSIFICATION OF WASTE TYPES GENERATED AT THE US

Wastes generated at the US may be classified as either general or hazardous. A wide variety of general wastes are generated while hazardous wastes include chemical, biological and radioactive wastes. This section describes the types of waste generated, which division generate it, its storage, removal, disposal, the volumes generated and concludes with discussion on waste minimisation and recycling.

3.2.1 The classification of wastes

Wastes are generated in a variety of states. According to the Department of Water Affairs and Forestry (DWAF) (1998: G-3) general wastes are those wastes "...that do not pose an immediate threat to man or to the environment...". Examples of such wastes are household waste, garden waste, dry industrial waste and commercial waste. Commercial waste is presumed to be waste generated by office-related activities. These waste types are all generated at the US.

Hazardous waste is defined in DWAF's (1998: G4) "Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste – Waste Management Series" document, as "...waste...that may cause ill-health ... in humans, fauna and flora, or adversely affect the environment when improperly treated, stored, transported or disposed of". Furthermore, this source states that South Africa has for practical purposes decided to list all the substances it deems hazardous in order of severity to classify and identify them. In this regard, lists of hazardous wastes have been defined and a Hazardous Waste Classification System (HWCS) (DWAF 1998) has been developed. Besides listing these hazardous substances, the HWCS also addresses the degree of hazard posed by each substance along with its critical exposure concentration levels. The HWCS does not, however, distinguish between the states (solid, liquid and/or gas) of the substances listed. Like general wastes, a variety of hazardous wastes are generated at the US. These wastes, although broadly classified as hazardous, include chemical wastes, biological wastes and radioactive wastes. They are generated in a variety of states, in varying quantities and with varying degrees of risk associated with the final waste product.

3.2.2 General waste generation at the US

The typical general wastes generated at the US are:

- i) Office waste, including paper, wrapping/packaging (both plastic and cardboard), metal objects (clips and staples), newspapers, printer cartridges, ribbons; bottles and containers (glass, plastic and styrofoam);
- ii) General household waste, including food packaging/wrapping materials, foodstuffs, bottles and containers (metal, glass and plastic), clothing and material.
- iii) Chemical wastes (non-hazardous liquid and solid), including empty containers (glass and plastic), residual/unused chemicals and detergents.

3.2.2.1 The sources of general waste

All divisions within the US generate general wastes. Divisions that generate larger volumes of this waste type are typically those with a larger number of people involved in the generating activities. Such activities or processes are primarily the administrative support services and accommodation or residential activities.

3.2.2.2 General waste storage

General wastes are continuously being generated throughout the year, although temporal variations in the volumes generated fluctuate during the year. These fluctuations typically occur during the US holidays. Irrespective of these fluctuations general waste storage facilities and general waste removal is required throughout the year.

General wastes are generally disposed of by the generator into collection bins situated throughout the US. These collection bins serve as temporary storage and collection points, pending removal either to a larger US-storage facility, or alternatively removal off the campus. These bins are the responsibility of the relevant service staff or “departmental assistants” employed at the respective divisions. The collection bins are emptied into divisional waste storage areas prior to final removal off campus. Waste storage areas may be used exclusively by a division or it may be shared. Sharing occurs where multiple divisions occupy the same building compounding the management responsibilities of these facilities. A variety of waste storage areas were found. These include:

- i) Dedicated waste storage areas outside buildings. These facilities are enclosed (Figure 3.1), or unenclosed (Figures 3.2 and 3.3);



Figure 3.1 Enclosed waste storage area outside the Natural Sciences Building



Figure 3.2 Unenclosed waste storage area outside the Nemesia Women's Residence



Figure 3.3 Unenclosed waste storage area outside the DF Malan Building

- ii) Dedicated waste storage areas or rooms inside buildings (Figures 3.4, 3.5 and 3.6). Such areas are typically vacant rooms, or dysfunctional spaces within buildings that have assumed the waste storage function. As is the case with the areas outside buildings they may be used solely for waste storage (Figure 3.5) or they may be used for the storage of other items like cleaning equipment or stocks of consumables (Figures 3.4 and 3.6).



Figure 3.4 Enclosed waste storage room inside the JC Smuts Building



Figure 3.5 Enclosed waste storage room inside the Administration Building (Block A)



Figure 3.6 Enclosed waste storage room inside the Merensky Building

- iii) Generally accepted waste storage areas (Figures 3.3 and 3.7). Over a period of time, certain open areas have assumed the role of waste storage area without any rational reasons, other than convenience. Attempts to erase such perceptions regarding these spaces have been found (Figure 3.8) where dedicated new facilities have been provided elsewhere.



Figure 3.7 Generally accepted waste storage area inside the Eendrag Men's Residence

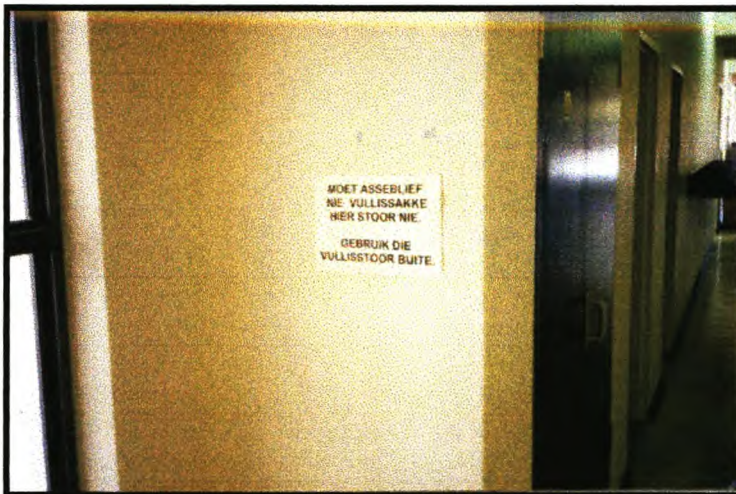


Figure 3.8 Reclaimed general waste storage area inside the JC Smuts Building

3.2.2.3 Adequacy of general waste storage areas

During the field-based survey phase of the study, it was evident that some of the older facilities, probably designed without provision for the burgeoning student population, are inadequate and waste overflows were apparent. Cases in point were the overflowing bins depicted in Figures 3.1 and 3.2. Respondents confirmed the inadequacy of storage areas in some of the older buildings. Alternatively, the frequency of waste removal by contractors is inadequate.

3.2.2.6 General waste disposal volumes

According to Kotze (in Van Lille 1998) the town of Stellenbosch generates approximately 90 tons of waste per day, or 630 tons per week. The US contributes 10% of this volume (63 tons per week). However in another interview Kotze (05/05/2000), the Stellenbosch waste manager estimated that 35-40 tons of compacted waste is removed from the US per collection round. At a removal frequency of three times per week, the total US volume rises to 110-120 tons per week. In terms of landfill space, one-ton of waste is equivalent to approximately 3m³. The US consumption of about 300m³ of landfill space per week and the town of Stellenbosch's 1800m³ per week means that 16,6% of the available landfill space at this site is consumed by the US alone.

3.2.3 Hazardous chemical waste generation at the US

The US generates a variety of chemical waste substances that are classified as being hazardous. These wastes are indicated in Table 3.1 and are classified according to the HWCS lists published by DWAF (1998) as either:

- i) Teratogens – which refer to substances that have the capacity to cause birth defects; or
- ii) Mutagens and carcinogens – which refer to substances that may cause genetic mutations and may produce or incite cancer. Such substances are subdivided into four classes viz. Class A (i.e. those substances whose effects have been clinically and epidemiologically proven in humans), Class B (i.e. those substances with effects proven without doubt in laboratory animals), Class C (i.e. those substances with effects proven with limited evidence in animals) and Class D (i.e. those substances with inadequate and doubtful data regarding effects); or
- iii) Solvents of concern – which refer to substances that may have an effect on the liners of landfills where this disposal method is utilised. Such solvents may effect the mobilisation of other wastes and treatment procedures that aims to destroy, immobilise and remove the hazardous constituents of waste. Waste leachate may enter regional water sources through damaged liners such as that installed along the eastern edge of the Stellenbosch landfill (Eichstadt 07/11/2000).

Table 3.1 Chemical wastes generated at the US (based on the DWAF (1998): Hazardous Waste Classification System)

<i>Waste substance as reported</i>	<i>Source</i>	<i>HWCS substance identification number</i>	<i>HWCS classification</i>	<i>Prescribed disposal method*</i>	<i>US disposal method</i>
Acetic Acid	Food Science	2790	Not classified	RCY; INC; LFB	E
Aceto Nitrile	Biochemistry	1648	Not classified	RCY; INC; LFB	ABW
Acetone	Botany, Chemistry, Horticultural Science, Food Science	1090	Solvent of concern	RCY; INC; LFB	E; ABW
Acids	Soil Science, Chemistry	Not listed	Not classified	No method prescribed	TWC
Alcohol	Microbiology	1170	Not classified	RCY; INC; LFB	E
Alkalines	Soil Science, Chemistry	Not listed	Not classified	No method prescribed	TC
Benzene	Botany, Microbiology	1114	Carcinogen & Mutagen (Class A)	RCY; INC; ENC; LFB	E
Boric Acid	Zoology	Not listed	Not classified	No method prescribed	E
Butanol	Botany	1120	Not classified	RCY; INC; LFB	E
Chloride (Halogenetics)	Chemistry	Not listed	Not classified	No method prescribed	E
Chlorinated Organic Solvents	Chemistry	Not listed	Not classified	No method prescribed	E
Chlorinated Solvents	Biochemistry, Polymer Science	Not listed	Not classified	No method prescribed	ABW; E
Chloroform (solid and liquid)	Botany, Zoology, Wine Biotechnology, Genetics, Microbiology, Food Science	1888	Teratogen, Carcinogen & Mutagen (Class B)	RCY; INC; LFB	E
Chromate (in water and organic solvents)	Chemistry	Not listed	Not classified	No method prescribed	E
COD solutions	Food Science	Not listed	Not classified	No method prescribed	TC
Diethylether	Food Science	1155	Solvent of concern	RCY; INC; LFB	ABW
DMSO	Zoology	Not listed	Not classified	No method prescribed	E
Ethanol	Zoology	Not listed	Not classified	No method prescribed	ABW
Ether	Chemistry, Genetics	Not listed	Not classified	No method prescribed	ABW; E
Ethidium bromide	Food Science	Not listed	Not classified	No method prescribed	E

Ethium bromide	Zoology, Microbiology, Plant Pathology	Not listed	Not classified	No method prescribed	E
Ethyl Acetate	Food Science	1173	Solvent of concern	RCY; INC; LFB	ABW
Ethyl Bromide	Food Science	Not listed	Not classified	No method prescribed	E
Fast Block K (Salt of Naphylacetate)	Zoology	Not listed	Not classified	No method prescribed	E
Fast Blue BB Salt	Zoology	Not listed	Not classified	No method prescribed	E
Formaldehyde	Wine Biotechnology, Genetics	1198	Teratogen	RCY; INC; LFB	E
Formalin	Zoology	Not listed	Not classified	No method prescribed	E
Formic Acid	Horticultural Science	Not listed	Not classified	No method prescribed	TWC
Fungicide (empty bottles)	Plant Pathology, Agronomy and Pastures	Not listed	Not classified	No method prescribed	E; TWC
Glass fibre resin	Polymer Science	Not listed	Not classified	No method prescribed	TC
Herbicide (Paraquat)	Plant Pathology	3016	Not classified	RCY; INC; LFB; HNR	TWC
Hexane	Horticultural Science, Food Science	1208	Teratogen	RCY; INC; LFB	ABW
Insecticide (empty bottles)	Agronomy and Pastures	Not listed	Not classified	No method prescribed	TWC
Iodine	Chemistry	Not listed	Not classified	No method prescribed	TWC
KOA	Botany	Not listed	Not classified	No method prescribed	E
Leucy B-Naphytl Amide	Zoology	Not listed	Not classified	No method prescribed	E
Lithium Bromide	Genetics	Not listed	Not classified	No method prescribed	E
Mercury Chloride	Zoology	1624	Not classified	RCY; IML; ENC; PRN	E
Mercury Residues	Chemistry	Not listed	Not classified	No method prescribed	
Mixed unknown chemicals	Chemistry	Not listed	Not classified	No method prescribed	E
Methanol	Botany, Zoology, Horticultural Science, Biochemistry, Food Science	1230	Not classified	RCY; INC, LFB	E, ABW, TWC

Nitrogen containing organic compounds	Polymer Science	Not listed	Not classified	No method prescribed	TWC
Non-chlorinated organic solvents	Chemistry	Not listed	Not classified	No method prescribed	ABW
Non-chlorinated solvents	Biochemistry, Polymer Science	Not listed	Not classified	No method prescribed	ABW
Organic solvents	Biochemistry, Chemistry	Not listed	Not classified	No method prescribed	ABW, E
Petroleum Ether	Chemistry, Food Science	1271	Not classified	RCY; INC, LFB	ABW
Phenol	Botany, Wine Biotechnology, Genetics, Microbiology, Plant Pathology	1671	Carcinogen & Mutagen (Class C and D)	RCY; INC, LFC; LFB	E
Picric Acid	Zoology	Not listed	Not classified	No method prescribed	E
Poly-irane	Polymer Science	Not listed	Not classified	No method prescribed	E
Polymixin	Food Science	Not listed	Not classified	No method prescribed	TC
Potassium Dichromates	Soil Science	2811	Not classified	RCY; IML, ENC; RCR	E
Propanol	Zoology, Chemistry	1274	Not classified	RCY; INC, LFB	ABW, TC
PVA paints	Polymer Science	Not listed	Not classified	No method prescribed	TC
Schiff reagents	Food Science	Not listed	Not classified	No method prescribed	E
Selenium	Soil Science, Chemistry	2658	Carcinogen & Mutagen (Class C and D)	RCY; IML, LFC	E
Silver Nitrate	Genetics	1493	Not classified	RCY; IML, ENC; PRN	E
Sodium Phosphate	Botany	8167	Not classified	RCY; IML, LFB	E
Sodium Residues	Chemistry	Not listed	Not classified	No method prescribed	TWC
Solvents	Microbiology	Not listed	Not classified	No method prescribed	E
Starch Gel	Zoology	Not listed	Not classified	No method prescribed	E
Sulphur	Polymer Science	Not listed	Not classified	No method prescribed	TC
Sulphuric Acid	Horticultural Science	1830	Not classified	RCY; NCR	TWC
Thallium	Chemistry	2727	Not classified	RCY; IML; ENC; LFC	E
Toluene	Food Science	1294	Teratogen, Carcinogen & Mutagen (Class C and D)	RCY; INC; LFC	ABW

Used Silica	Chemistry	Not listed	Carcinogen & Mutagen (Class B)	No method prescribed	TWC
Water Emulsifiers	Polymer Science	Not listed	Not classified	No method prescribed	TC
Weedkiller (empty bottles)	Agronomy and Pastures	Not listed	Not classified	No method prescribed	TWC
Xylene	Botany, Zoology	1307	Teratogen, Carcinogen & Mutagen (Class C and D)	RCY; INC; LFB	E; ABW

Key to disposal method abbreviations used in Table 3.1

Abbreviation	Disposal Method	Description
ABW	Ash blend, weather	Similar to LFB.
E	Encapsulate	Similar to ENC.
ENC	Encapsulation	The containment of waste in approved containers or drums in a reinforced concrete cell within a permitted hazardous waste landfill.
HNR	Hydrolise & Neutralise, landfill codispose	Hydrolysis of a waste compound using an acid or base followed by neutralisation prior to landfill codisposal.
IML	Immobilisation, then landfill	All immobilisation techniques including microencapsulation, vitrification and solidification but excluding macroencapsulation.
INC	Incineration	The thermal destruction of waste in an approved facility.
LFB	Landfill-ash blend	Blending of flammable waste with ash to increase the flash point. The resultant product must be landfill co-disposed with municipal or commercial waste.
LFC	Landfill codispose	Blending hazardous waste with general waste in a permitted landfill.
NCR	Neutralise, landfill codispose	The addition of lime, acid or alkali to waste to neutralise it prior to landfill codisposal.
PRN	Precipitation, landfill codispose	The addition of solidifying agents to solutions to extract insoluble compounds/solids prior to landfill codisposal.
RCR	Reduction, landfill codispose	Reduction by the addition of reducing agents prior to landfill codisposal.
RCY	Recovery	Recycling, reuse and reutilisation techniques.
TC	Trench, codispose	Similar to LFC.
TWC	Trench with chemical	Similar to NCR.

3.2.3.1 Problems in terms of the HWCS-listing status

It should be noted that the above classification is dependent on concentration levels, volumes and critical thresholds being exceeded. Although the theoretical concentration levels, thresholds and volumes are known, insufficient data on volumes and occurrence have been recorded in this study to enable proper evaluation.

Not all chemical waste substances are classified. Where substances exist that are not classified the generator is required to apply to DWAF for an assessment of the risk status of these unlisted chemical waste substances. The application process to have unlisted substances classified is based on a precautionary approach that deems all unlisted substances as hazardous because its safety status is unknown.

3.2.3.2 The sources of hazardous chemical waste

The sources or generators of this waste are primarily those divisions associated with education and research activities at both under- and post-graduate level and include the divisions of Agronomy and Pastures, Biochemistry, Botany, Chemistry, Food Science, Genetics, Horticultural Science, Microbiology, Plant Pathology, Polymer Science, Soil Science, Wine Biotechnology and Zoology as indicated in Table 3.1. These divisions are spatially displayed in Figure 3.10 according to the buildings they occupy, concentrated in the older buildings surrounding the central Jan Marais Square, except for the Food Science's division that is situated on the outskirts of the US. These buildings are easily accessible and centrally located on the central campus. Except for the JC Smuts building, all the buildings are relatively old.

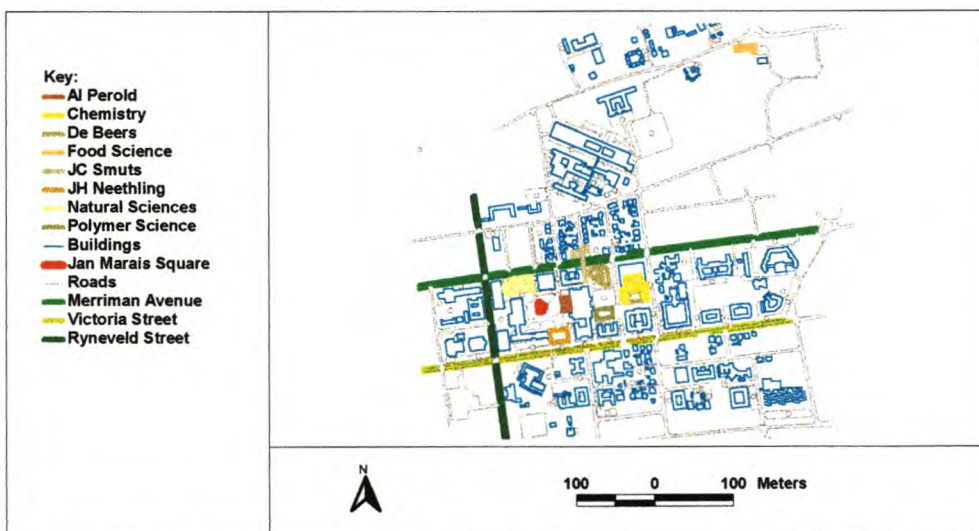


Figure 3.10 The distribution of hazardous chemical waste generators at the US

3.2.3.2 Hazardous chemical waste removal

An external contractor (viz. Waste-tech) that specialises in the collection and disposal of chemical wastes removes such wastes from the US. According to the chemical waste procedures issued by the USRPS (2000), and confirmed in the statements elicited by the questionnaire, this contractor supplies the packaging or collection containers in which such wastes are collected and stored pending their removal from the generating division. Generating divisions are therefore responsible for the storage, packaging and labelling of such wastes pending removal. The frequency of removal of chemical waste from the US is demand driven and hence the generating division will have to request that the waste be collected within a scheduled collection programme. The frequency of this scheduled collection service is at least once per month but may be increased depending on the demands of the generating division (USRPS 2000). Collection dates supplied by the USRPS for 2001 indicate that removal of this waste has been scheduled throughout the year, irrespective of the academic cycle or the status of waste storage.

3.2.3.3 Hazardous chemical waste disposal

The disposal of any hazardous waste is the responsibility of both the generator and the disposer, where the disposer differs from the generator. Because the US utilises the services of an external waste collection and disposal contractor an assessment of the chemical waste disposal methods exercised by this contractor has been performed. Contained within Table 3.1 are the disposal techniques as prescribed by DWAF (1998) as well as the actual disposal techniques employed by the US. These techniques are those reported by the contractor in the USRPS-survey. It is evident from Table 3.1 that although the abbreviations used by this contractor differ from those used by DWAF (1998), the techniques employed by the contractor are congruent with the prescribed techniques (EnviroServe 2000). The apparent differences that exist are the result of different abbreviations being used for the same disposal techniques.

DWAF (1998) has adopted an integrated approach to waste management and hence the numerous references to recovery (i.e. "RCY") and reduction (i.e. "RCR") practices in its classification list. Such practices are to be implemented by the generator and hence no reference is made to these by this service provider.

Also evident from the techniques employed by the contractor is a precautionary approach to the various unlisted chemical substances generated at the US. The majority of these are encapsulated (i.e. "E") – a method by which waste is contained in an approved container and disposed of in reinforced concrete cells within a permitted hazardous waste landfill site. According to the contractor, hazardous chemical wastes and substances removed from the US are disposed of at the Vissershok landfill site. This site is classified as a hazardous landfill site serving the Western Cape region and is situated approximately 34 kilometres from the US. Figure 3.9 indicates the location of the licensed Vissershok hazardous waste landfill site in relation to the US. The sphere of influence of the US thus extends beyond the confines of the US and the town of Stellenbosch. Hazardous waste generation by the US thus has regional impacts in the Western Cape.

3.2.4 Biological waste generation at the US

For the purpose of this study, biological waste includes wastes generated during educational and research activities and medical service activities operating at the US. The medical service provides an on-campus medical service to resident students. It thus excludes food wastes generated by the accommodation and recreational activities occurring at the US – as these are classified as general wastes. It thus includes medical and infectious wastes as well as the equipment and containers used during biological waste generation processes. According to the DWAF (1998), medical wastes refer to those wastes generated by doctor's rooms, hospitals and clinics, laboratories and research facilities. All these occur at the main US Stellenbosch campus except for the hospital that operates at the US Tygerberg campus.

Biological and medical wastes are regarded as being infectious substances or wastes. Infectious substances are defined by DWAF (1998: G-5) as being "...micro-organisms, including those which have been genetically modified, pathogens, cells, cell cultures and human endoparasites which have the potential to provoke infection, allergy or toxic effects..." and "...any waste which is generated during the diagnosis, treatment or immunisation of humans and animals, in research pertaining to this, in the manufacturing or testing of biological agents – including, blood, blood products and contaminated blood products, cultures, pathological wastes, sharps (instruments), human and animal anatomical wastes and isolation wastes that may contain infectious

substances...”. The generation processes and descriptions provided in these definitions are operative in the research, education and medical service activities occurring at the US. Examples of biological wastes generated at the US include plant and animal tissues and remains, blood, urine, bacterial and fungal cultures and residues, experimental food waste, containers (e.g. petri-dishes, test tubes), sharp instruments (e.g. needles, knives and blades), contaminated cleaning materials, swabs, gloves and sanitary waste.

3.2.4.1 The sources of biological wastes

According to the survey, the divisions of Botany, Zoology, Microbiology, Plant Pathology, Food Science, Entomology and Nematology, Wine Biotechnology, Soil Science and the Student Health Services (SHS) have indicated that they generate biological waste. These divisions are spatially displayed in Figure 3.11 according to the buildings they occupy. These divisions are concentrated in the buildings surrounding the central Jan Marais Square, except for the Student Health Services, located closer to the student residences and the Food Sciences division located on the outskirts of the US. Except for the JC Smuts building, all the buildings housing these divisions are relatively old, but are easily accessible.



Figure 3.11 The distribution of biological waste generators at the US

3.2.4.2 Biological waste removal

All divisions surveyed have indicated they utilise the services of an external contractor (viz. SanuMed) that specialises in the collection and disposal of biological wastes to remove and dispose of such wastes. According to the biological waste procedures issued by the USRPS (2000) and confirmed in the questionnaire survey, this contractor supplies the packaging or collection containers in which such wastes are collected and stored pending their removal from the generating division. The frequency of biological waste removal from the US is demand driven and hence the generating division will have to request that the waste be collected within a scheduled collection programme. The frequency of this scheduled collection service is however twice per month and dependent on the demands of the generating division (USRPS 2000). Collection dates supplied by the USRPS for 2001 indicate that removal of this waste has been scheduled throughout the year, irrespective of the academic cycle or the status of waste storage.

3.2.4.3 Biological waste disposal

Biological wastes are disposed of in accordance with the method deemed appropriate by this contractor. Similar to hazardous chemical wastes, the collection, storage, labelling and packaging of biological wastes are the responsibility of the generating division of the US. The disposal of these wastes is, however, also the responsibility of this contractor. According to the recommended disposal methods and techniques proposed by this contractor, biological wastes collected from the US are incinerated and disposed of at the licensed Vissershok hazardous landfill site (see Figure 3.9 for its location).

Not all biological waste is however disposed of in this manner. During the field interview phase, it was reported that some divisions, although utilising the services of the contractor, undertake their own collection, removal and disposal of biological wastes. Where this occurs, the waste is disposed of by incineration, at the State Veterinary incinerator located in Stellenbosch. The location of this facility is likewise, indicated in Figure 3.9. Incinerated residues are buried on the premises of this facility – a practice that may have detrimental impacts on the environment (Willows 23/11/2001). According to Willows (23/11/2000) this facility, at the time of writing, is in the process of applying to be licensed both in terms of Section 20 of the

Environment Conservation Act, 1989 and the Second Schedule of the Atmospheric Pollution Prevention Act, 1965.

3.2.5 Radioactive waste generation at the US

Radioactive waste substances are defined by DWAF (1998) as substances that emit or exhibit radioactivity. Radioactive waste is generated at the US primarily by those divisions involved in research and educational activities. According to the survey undertaken, the divisions of Botany, Horticultural Science, Microbiology and Wine Biotechnology indicated that they generate radioactive waste. Additional divisions identified in the survey undertaken by a waste removal contractor include Zoology, Genetics and Biochemistry. These divisions are spatially displayed in Figure 3.12 according to the buildings they occupy, concentrated in the older buildings surrounding the central Jan Marais Square, except for the JC Smuts Building. Of significance is the concentration around the Square, and proximity to access routes.



Figure 3.12 The distribution of radioactive waste generators at the US

Both liquid and solid phase radioactive wastes are generated at the US and include P32, P33 and C14 radioactive liquid and solids. Contaminated containers and utensils (both plastic and glass), cleaning materials and clothing are regarded as being radioactive waste and require disposal.

3.2.5.1 Radioactive waste removal

As is the case for chemical and biological wastes, radioactive waste is collected and removed from the generating division by an external contractor (viz. Waste Tech).

The storage, packaging and labelling is the responsibility of the generating division pending the collection of the waste by the contractor. This contractor provides storage containers and the removal frequency is demand driven in accordance with the frequency of removal determined by the USRPS waste procedures (USRPS 2000). The frequency of this scheduled collection service is at least once per month and dependent on the demands of the generating division (USRPS 2000). Collection dates supplied by the USRPS for 2001 indicate that removal of this waste has been scheduled through out the year, irrespective of the academic cycle.

3.2.5.2 Radioactive waste disposal

The contractor employed undertakes radioactive waste disposal. Such wastes are disposed of at the licensed Vissershok hazardous waste landfill site (see Figure 3.9 for its location) in accordance with a method determined by the removal contractor. These methods are in accordance with the minimum requirements as prescribed by DWAF (1998) (EnviroServe 2000).

However, according to questionnaire responses certain divisions dispose of radioactive waste themselves. An example of this self-disposal is where radioactive liquids are stored for periods until radiation is undetectable. Once undetectable, these liquids are then disposed of via the "...normal wastewater treatment system". These wastes are stored in the common waste storage area. Record-keeping of these wastes are however limited. No evidence of any authority approval for this disposal method could be ascertained.

3.2.6 Hazardous waste storage facilities at the US

Where divisions utilise the services of a waste removal contractor, this contractor provides suitable storage containers. The sizes and suitability of these containers have been determined by the USRPS-survey and are in accordance with generally accepted industry standards. The collection, packaging and labelling of these containers as well as its storage pending collection are the responsibility of the generating division. It is these storage facilities or areas that are the focus of this section. Hazardous wastes – including chemical, biological and radioactive wastes – are stored in unenclosed storage areas inside buildings (Figures 3.4 and 3.13) and in dedicated enclosed storage areas outside buildings (Figures 3.14 and 3.15).



Figure 3.13 Unenclosed waste storage area inside the Natural Sciences Building

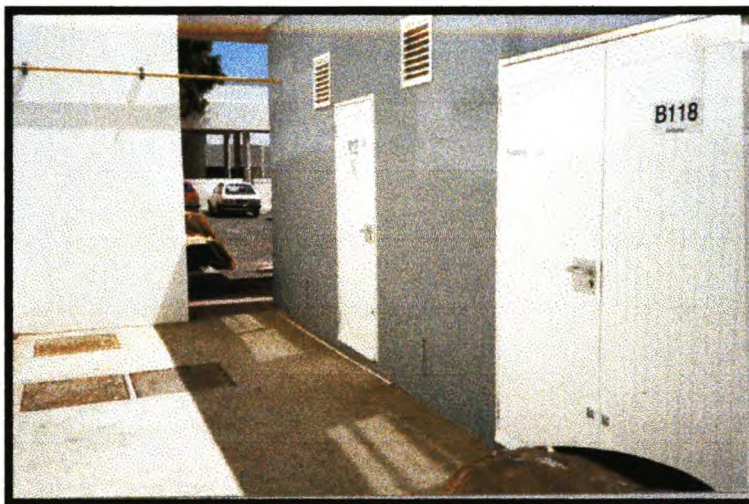


Figure 3.14 Enclosed waste storage area outside the JC Smuts Building

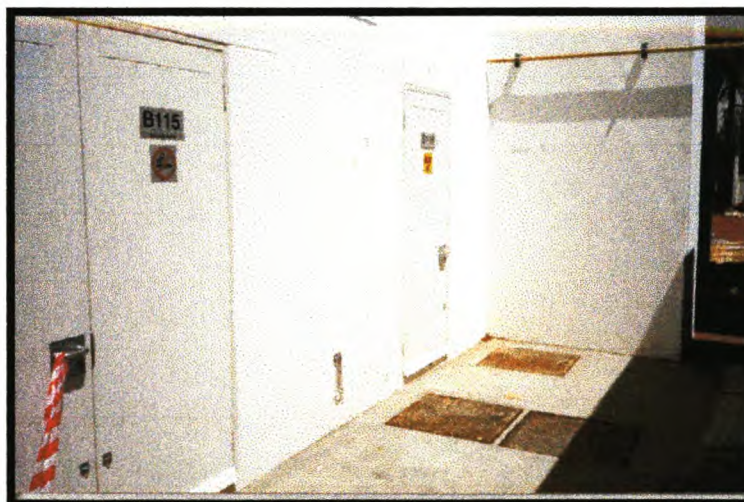


Figure 3.15 Enclosed waste storage area outside the JC Smuts Building

Hazardous wastes are often stored in special containers in the laboratories and facilities within which they are generated, accounting for the high frequency of storage facilities in buildings. In recently constructed buildings these storage areas have been specially constructed or altered to comply with specific safety requirements. This however, is not the case with older buildings. Older buildings were not constructed in tandem with contemporary safety standards and often do not meet the safety standards required by both the US and regulating authorities. This sentiment is expressed in the responses elicited by the questionnaire (as indicated in the next section).

3.2.7 Adequacy of hazardous waste storage areas at the US

The US requires any waste storage facility to be located in a "... well ventilated room or area with controlled access, normally not under the same roof as office and laboratory space. This area should have a containment well capable of retaining any spills, with no possibility of leakage into the stormwater or onto any public area and should be remote from sources of ignition or fresh air intakes of air conditioning systems" (USRPS 2000). According to the DWAF (1998), temporary storage areas for storing waste must have a waterproof base that cannot be penetrated by storm water, it must feed into a closed drainage system with a waterproof spillage collection area to allow for the recovery and treatment of spillages. Additionally, access to these areas must be controlled and these facilities are to be clearly signposted. DWAF (1998) also requires the separation of wastes in terms of its compatibility, combustibility and flammability. Wastes are also to be separated from other products and/or materials.

This research concludes that not a single US hazardous waste storage area/facility fully conforms to these requirements.

The following responses elicited in the questionnaire complement this conclusion:

- "Die geskikte stoor area vir die afval by die Departement is 'n probleem";
- "A uniform manner of waste removal must be introduced and implemented for the whole campus, together with written guidelines regarding waste and the safe storage and removal thereof. The University is attempting to reduce the frequency of waste removal by external contractors. However, this implies that

individual departments and research units must store waste for longer periods of time. This requires a significant amount of space, which is not available, especially in the 'old' buildings. A central (or a few) storage facility would certainly alleviate this problem”;

- “Empty liquids containing radioactive materials into plastic drums in the perspex containers in Lab 333 (JC Smuts building)”.

Newer buildings have, however, been designed and constructed in compliance with the standards and requirements expressed by both regulating authorities and the US regarding waste storage areas. One such facility is the waste storage facility constructed to serve the Department of Microbiology housed in the relatively new JC Smuts Building (Figures 3.14 and 3.15). This facility has separate storage areas for chemical products, flammable chemical products, a general (dry) waste store, a wet waste store and a radioactive waste store. The layout of this store is indicated in Figure 3.16.

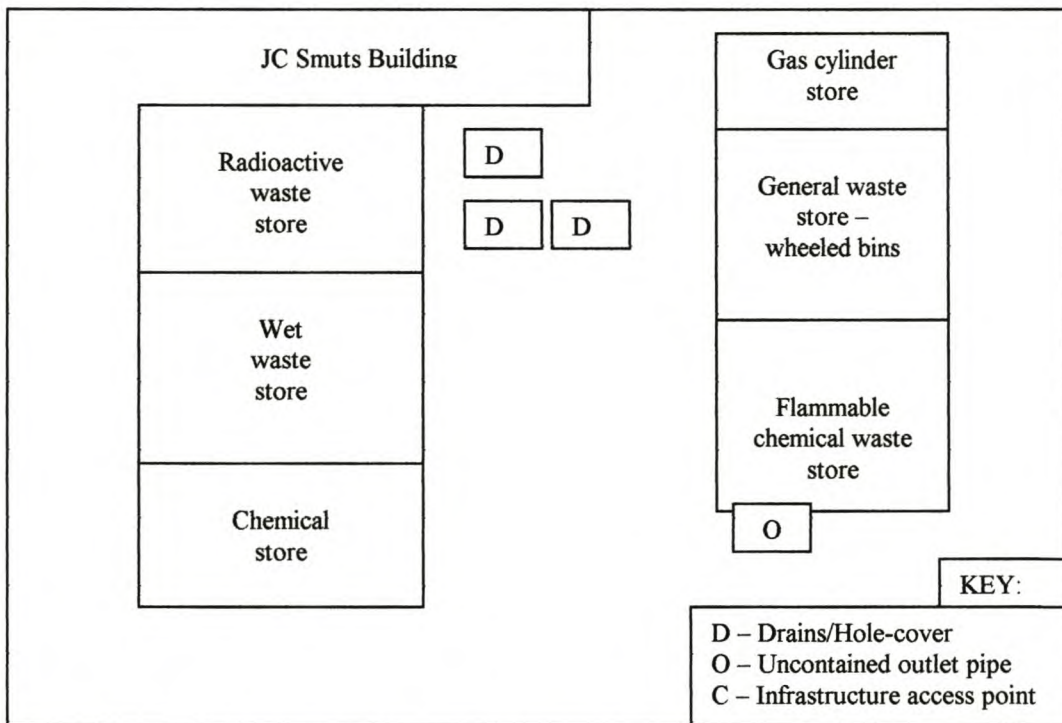


Figure 3.16 Layout plan for the waste storage area outside the JC Smuts Building

Although on site the area is clearly marked to indicate the contents of the rooms, no warning signs were posted at the time of observation. The facility is also not fenced off and access is virtually unrestricted although the area was cordoned off with barrier

tape. The facility boasts an internal drainage system and the rooms are ventilated and air-conditioned. The drainage system is, however, not closed and the containment requirement of the regulating authority was not evident as shown in Figure 3.17, where the outlet pipe drains onto the forecourt.

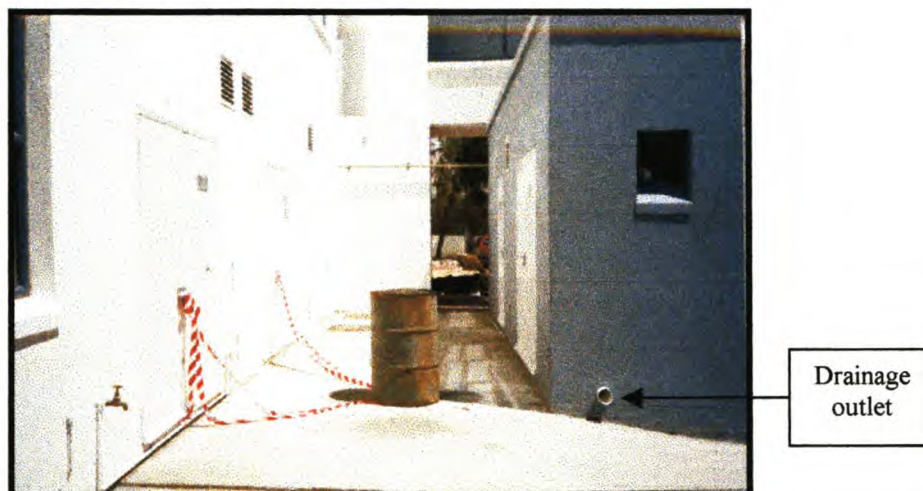


Figure 3.17 The uncontained drainage system for the waste storage area outside the JC Smuts Building

The forecourt is unbermed and therefore uncontained. Three service infrastructure access points are located in front of the radioactive waste store. These could presumably be access points for wastewater works, stormwater works, cabling or communication networks, or for a specialised drainage system for hazardous waste in the event of a spill. The pathway adjacent to the facility has a sewerage pipe cleaning access point that also represents a point of ingress for spills to penetrate the effluent system. Thus, it is apparent that not all the requirements of the authorities have been explicitly met. This facility also has a liquid petroleum gas (LPG) store in close proximity abutting the general waste store under the same roof. This represents an additional hazard in the event of a disaster. At the time of observation the access gates to LPG cylinders were unlocked, indicating inadequate access control.

3.2.8 The volume of hazardous wastes generated at the US

Although the questionnaire provided for divisions to indicate the volumes and units of waste generated, inadequate data regarding this matter was provided. Most divisions that responded were unable to supply this information and hence primary data sources could not be utilised. While many respondents ignored this item, some respondents volunteered the following comments as to why such data was not available:

- “Geen idee van volumes en tons. Ons is egter tans in samewerking met US Beskermingdienste met 'n verwydering program besig en behoort aan einde van 2001 'n beter idee te hê”;
- “Let asb. op dat geen massas in die dokument gegee word nie. Die syfers is nie beskikbaar nie, en daar is, weens personeeltekorte, geen voorneme om dit binne die afsienbare toekoms te bepaal nie”;
- “U sal oplet dat daar GEEN syfers (massas, hoeveelhede) is nie, omdat hierdie gegewens nie beskikbaar is nie. Daar is ook nie enige planne om binnekort met die bepaling daarvan te begin nie, aangesien geen arbeid daarvoor beskikbaar is nie.”

When considering the secondary data sources (the Waste-tech and SanuMed reports), the quantities reported relate to the volumetric capacity of the collection containers supplied to generating divisions in which wastes are temporarily stored pending their removal by the contractor. The actual volumes of waste requiring disposal are not recorded. Neither can it be assumed that these containers are filled to capacity when removed, simply because it is a requirement that these wastes be removed as soon as possible.

The US does, therefore, not have an accurate assessment of the quantities of hazardous wastes it generates. This will have to be ascertained should it intend to implement an integrated waste and/or environmental management system that would inevitably involve all aspects of waste management at the US.

3.3 WASTE REDUCTION AND MINIMISATION AT THE US

Waste reduction and minimisation is an integral part of many of the environmental charters and regulatory frameworks that are in place (as was evident in Chapter 2). While the membership of such charters is voluntary and hence non-commitment to such endeavours is possible, this is not the case in terms of regulatory frameworks. According to the WPIPWM (South Africa 2000a), the functional approach to integrated pollution and waste management will require the implementation of source-based controls together with impact management and remediation in terms of the receiving environment. Source-based controls refer to the implementation of

strategies and actions to reduce waste at the source of generation. This may include the implementation of recovery, recycling, re-use and reduction processes at the source of generation.

3.3.1 Divisional waste minimisation practices

According to the questionnaire and interview responses elicited, waste minimisation and recycling is practiced in varying degrees at the US. Various divisions have initiated such practises as indicated in Table 3.2. In the absence of a uniform central policy and guidelines waste minimisation and recycling is not practised systematically at the US. Individual organisational entities are allowed to practice such initiatives, as they deem adequate. Where such practices do occur, they apply to familiar recyclable wastes (e.g. office wastes – primarily paper) only. While such efforts are notable they do not seriously address the need to reduce the volume of waste generated at the US, nor is it aimed at reducing the costs of waste management at the US. The study therefore concludes that it is rather an action in response to growing environmental awareness or alternatively, to the need to generate additional income.

Table 3.2 Waste reduction and minimisation per division

<i>Division</i>	<i>Type of waste</i>
Institute of Polymer Science	Office, Chemical (liquid and solid), Gaseous, Equipment
Botany	Office, Biological
Microbiology	Office
Plantpathology	Office
Physics	Office
JS Gericke Library	Office
Food Science	Office, Equipment
Forestry Science	Office
Office of the Dean: Agricultural Sciences	Office
Entomology & Nematology	Office
Institute of Wine Biotechnology	Office
Chemistry	Office, Chemical (Liquid and Solid)
Nemesia Women's' Residence	Office
Eendrag Men's' Residence	Office

Figure 3.18 displays the spatial distribution of the entities that have initiated such programmes according to the buildings they occupy. These divisions are scattered throughout the US and no pattern can be distinguished.



Figure 3.18 Waste minimisation practitioners at the US

3.3.2 Paper recycling at the US

In line with the universal practice, paper is the most common waste that is recycled at the US. A variety of waste-paper collection and storage facilities exist, in the absence of a recycling policy. Examples of such collection points and storage facilities are indicated in Figures 3.19, 3.20 and 3.21.



Figure 3.19 Waste paper collection facility inside the Nemesia Women's Residence



Figure 3.20 Waste paper collection facility inside the Eendrag Men's Residence



Figure 3.21 Waste paper collection facility inside the RW Wilcocks Building

In the absence of a guiding policy it is inevitably the divisional assistants who take responsibility for the collection and recycling of waste paper. Although no formal policy exists, waste paper collection is centrally administered for administrative and financial reasons. A programme manager, appointed under the auspices of the US Administration centrally controls the waste paper collection programme. Divisions are required to inform the programme manager when their waste paper may be collected. A single company appointed by the US collects the paper paying a fixed per-weight tariff to the central programme account. Individual disbursements are made to the divisions from which the paper was collected. Divisions are thus allocated cost points into which disbursements are made. Payments are made periodically and are subject to deductions as a result of the central administrative costs. Divisions are thus not the only beneficiaries of this additional income, as a portion of all the income generated is allocated to the central administration.

This centralised system has not always been the manner in which waste paper, in particular, was recycled. The collection and sale of waste paper used to be the direct responsibility of divisional assistants. Indications by respondents and those interviewed are that the discounting of monies received, the lower prices paid by the sole collection agency as well as the periodic nature of pay-outs have affected waste paper recycling. Statements reflecting this opinion have been provided by respondents or stated during interviews. Typical statements reflecting the above sentiment are:

- “Afval papier was in die verlede deur NAMPAK verwyder. Die assistente het die papier of karton in groot sakke gesit en die assistente is direk betaal per gewig. Toe besluit die Universiteit om dit te administrateer. Lothlorien haal nou die papier. Vorms moet ingevul word en omdat administrasie iets kos haal hulle nou 20% af van die geld wat die assistente behoort te kry. Omdat dit kleiner hoeveelhede is en die geld via administrasie kom voel die assistente dit is nie meer die moeite waarde nie. Ek voel – of ‘n welsyns organisasie behartig herwinning – of dat die assistente deur die herwinnings maatskapy direk betaal word. Dit is dus ‘n geval van ooradministrasie. Ek self gebruik baie keer die die agterkant van ‘n papier”.
- “There is very little control except where I am actively involved”.

According to Barnard (2001), the paper recycling programme manager at the US, about 130 tons of waste paper was collected in 2000. This includes white office paper, mixed paper and cardboard.

Waste minimisation practices at the US is not widespread or comprehensive and where such practices do occur, for example in the case of waste paper recycling, structural mechanisms exist that hamper the effectiveness of these practices. In the absence of an explicit waste minimisation policy, the US is unable to benefit directly, for example in the form of cost savings and resource recovery, nor indirectly in terms of achieving the goals of sustainable development and environmental management.

CHAPTER 4: INTEGRATING ENVIRONMENTAL MANAGEMENT AND WASTE MANAGEMENT AT THE UNIVERSITY OF STELLENBOSCH

Both regulatory and non-regulatory frameworks have been developed to address waste and environmental issues as discussed in Chapter 2. Critical elements required by these frameworks include adopting systematic management practices and basing decisions on adequate information. This requirement is based on the international recognition of efficient management and information systems as indicators of the quality of management practiced by organisations. This chapter discusses the recognition and development of environmental management systems.

4.1 MANAGEMENT AND INFORMATION SYSTEMS AS ACCEPTABLE MANAGEMENT TOOLS

Organisations implement, *inter alia*, financial, human resources, marketing, production and manufacturing management systems to ensure a systematic approach to the rational and efficient operation of the organisation. Such systems are virtually entrenched and many an organisation cannot operate without these in place. The generic principles that underlie the formulation of such systematic approaches have evolved in accordance with both the general requirements and specific needs of specific sectors within particular management and market environments. These systems compliment the regulatory environment. Regulatory controls (often with punitive measures to address non-compliance) require information to be available on specific aspects of an organisation's operation. The tax system for example, requires information on income, expenditure and profit Likewise, the proposed regulatory mechanisms regarding waste management in South Africa require detailed record keeping of waste information (South Africa 2000b).

4.1.1 The organisational role of environmental management systems

The best available option to meet the requirement of recording waste information and managing an organisation's environmental impacts is the implementation of an environmental management system (EMS). According to the South African counterpart of the International Standards Organisation (ISO) – the South African Bureau of Standards (SABS), an EMS is defined as a sub-system of the overall

management system of an organisation (SABS 2000). The EMS spells out the structures, practices, processes, resources and responsibilities that the organisation utilises to address environmental management. By implementing an EMS an organisation will be able to:

- i) achieve and demonstrate compliance with relevant and applicable legislation (i.e. meet the regulatory control requirements); and
- ii) control its environmental impacts in accordance with self-declared environmental policies.

4.1.2 The development of environmental management systems

Like other management systems, EMS is not a new concept. This system has been implemented and operated by numerous organisations globally, albeit in a variety of formulations. Examples of such systems include the British BS7750, the European Eco-Management and Audit Scheme (Souter & Möhr 1993), the American ANSI/ASQC E4 Standard on Environmental Management (Sayre 1996) and the South African SABS 0251/1993 (Coetzee 1994). However, subsequent to the environmental crises that occurred in the latter half of the twentieth century, the realisation dawned that business and industry required tools and techniques to help improve and measure their environmental performance (Van der Merwe 1997; SABS 2000). The environmental imperative was however not the only reason for the development of such a system. An additional factor motivating the creation of a uniform environmental standard was the increase in world trade as globalisation increased. International trade was hampered by the proliferation of standards, systems and inconsistencies on a regional, national and organisational level. These represented technical barriers adversely affecting the efficiencies required by international trade (SABS 2000).

An internationally acceptable environmental management standardisation system was thus required, a task awarded to ISO (Van der Merwe 1997; SABS 2000). ISO and its substructures developed the ISO 14000 EMS, aimed at harmonising the standards that existed at the time and aimed at achieving and measuring environmental performance. The ISO 14000 EMS is and never was intended to replace existing environmental management systems, if already implemented. Rather, it provided guidance on how to implement a new system or alternatively upgrade or improve an existing system to

meet the ISO's standards. The ISO 14000 EMS may thus be compiled for any organisation and within any socio-economic, political, economic or cultural setting.

The ISO 14000 EMS has been developed to operate in either a co-regulatory or self-regulatory framework. The co-regulatory framework is the opposite of the "command-and-control" framework whereby authorities impose strict controlling legislation with punitive measures should there be non-compliance and transgression of the legislation. Within a co-regulatory framework, authorities and organisations work together to achieve an environmental result beneficial to and desirable by both parties, often with incentives for complying organisations. Co-regulation is uncommon in South Africa, although promoted by the concept of environmental management co-operative agreements contained in NEMA.

In the absence of a regulatory authority an EMS may be voluntarily developed, implemented and monitored by that organisation itself. Self-implementation is often referred to as self-regulation and represents a viable option for institutions like the US as it allows for flexible implementation.

4.1.3 The elements of the ISO 14000 EMS

According to Van der Merwe (1997) and SABS (2000), the important elements of an EMS within the self/co-regulatory framework are those that will enable an organisation to achieve the following:

- take stock of its environmental impacts;
- establish objectives and targets to address its environmental impacts;
- commit itself to effective and reliable processes, the prevention of pollution and continual improvement; and
- obtain commitment from all employees and management to share responsibility and awareness for the organisation's environmental performance.

The core components of the ISO 14000 EMS are integrated within a system model as depicted in Figure 4.1. To ensure the self-reflection and continual improvement objectives of an EMS, the model is represented as a cycle.

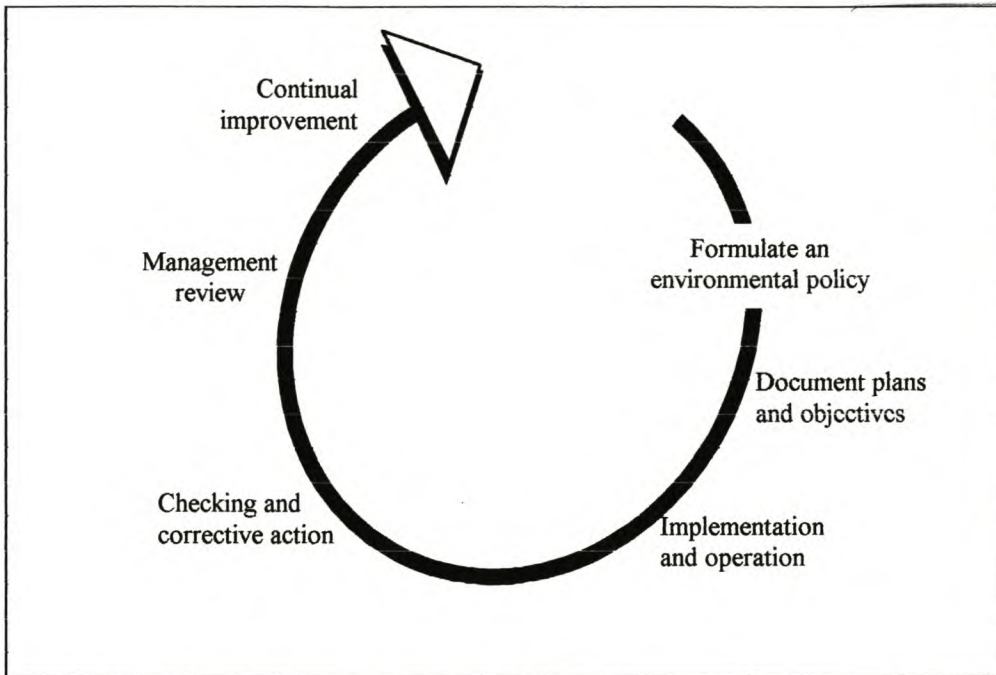


Figure 4.1 SABS ISO 14000 EMS model

The core components of the EMS are:

- i) An environmental policy statement – that refers to a policy statement endorsed by the top management of the organisation. This policy reflects the organisation's goals in relation to environmental management and performance. This policy should enable the organisation to:
 - continually improve its environmental performance;
 - comply with regulatory standards;
 - document and communicate its objectives and targets; and
 - have its policy scrutinised and accessed by the public and its employees.
- ii) Documented planning – that reflects the identification of the organisation's environmental relationships and impacts and the legal requirements regulating its activities, products and services. Via planning, the organisation should develop and document environmental management objectives. The objectives should be developed in a sectoral manner, addressing the different operational, administrative and management sectors and operational activities within the organisation.
- iii) Implementation. To achieve the policy objectives. The EMS must be implementable and actually implemented. This requires financial and human

resource allocation. Internal and external training and awareness programmes may be required, while communication and operational programmes and procedures may have to be developed.

- iv) Monitoring and control mechanisms – that constitute an internal auditing programme aimed at:
- aiding management's review of the EMS;
 - determining conformity with the EMS;
 - ensuring the timeous application of corrective and/or preventative actions where and when required; and
 - ensuring the documentation of monitoring and auditing programmes.
- This requirement must be adhered to should the organisation intend obtaining independent external certification.
- v) Management review – of the EMS ensures commitment, adherence, efficiency, continuity and continual improvement of the organisation's environmental performance. This improvement may be the result of technological trends. The implementation of the EMS may require the re-allocation of human and financial resources within the organisation. Management review ensures that such reallocations are adhered to.

4.1.4 Benefits of implementing an ISO 14000 EMS

Van der Merwe (1997) lists the following as benefits accruing from ISO 14000 certification – achievable even if formal certification is not obtained – since certification is voluntary:

- i) The reduction of hazardous waste as a result of better waste management practices, recycling and a reduction in natural resource consumption. This results in environmental protection.
- ii) Long term cost reduction after the initial expenditure for development and implementation costs of the EMS. This includes cost savings resulting from using less chemicals and concomitantly, reducing cleanup costs.
- iii) The better management practices and the reduction of material use will result in fewer injuries to staff and thus less productive time lost. An improvement in working conditions is the result of implementing such a system.
- iv) Improved top management attention and commitment is required for the development, implementation and certification of such systems. This results in

environmental management not only being afforded “lip-service” but because it is a stipulated requirement, financial and human resources are allocated to this function.

- v) The development and implementation of an EMS results in improved and more effective (environmental) management systems. Included in such systems may be regulation databases and waste tracking systems.
- vi) An improvement in community relationships, and customer/client/student/staff satisfaction as a result of the pro-active approach being adopted. This includes satisfying the growing public awareness and concerns about environmental issues.

According to Potgieter (1998), the benefits that may accrue with specific reference to the implementation of an EMS at a university include:

- i) an increase in environmental awareness amongst the future generations and leaders of tomorrow;
- ii) the ability to meet societal obligations and commitments with regards to promoting sustainable development; and
- iii) market advantages.

4.2 THE IMPLEMENTATION OF AN EMS-WASTE MANAGEMENT SYSTEM AT THE US

As a responsible and environmentally aware institution the US should become a signatory to the environmental declarations described in Chapter 2, and for that purpose alone it will be incumbent to implement an institutional EMS.

In terms of the regulatory framework, it is also incumbent on the US to address the information requirements emanating from current and pending legislation, specifically with regards to waste management. In terms of implementing an ISO 14000-type EMS, the SABS requires, as part of its certification procedure, an assessment of the implementation of all relevant legislation (SABS 2000) and hence the reference to the legislation in Chapter 2. Additionally, the US has committed itself to “...resource utilisation that is both effective and efficient” (University of Stellenbosch 1999: 9) as a strategic priority supporting its vision. This priority can be achieved by implementing an EMS.

Three options exist for the implementation of an EMS at the US (the choice depending on the strategic outcome of the chosen option). These options are:

- i) The implementation of an all-incorporating EMS that is aimed at addressing the environmental performance of the entire US;
- ii) The implementation of a waste management system complying with ISO 14000 EMS requirements, that could easily be incorporated into a US-wide EMS at a later stage; and
- iii) The development of a comprehensive Safety, Health and Environmental System (“SHE”), that could encapsulate both the US’s obligations towards relevant occupational, health and safety requirements and improving its environmental performance. The ISO 18000 Series addresses this integration. The US has, in respect of legislation governing occupational health and safety, developed a “Risk Management Policy” (US 1998). A copy of the policy is appended as Appendix N. This policy will have to be expanded to incorporate the environmental aspects.

It is beyond the scope of this study to effectively and adequately recommend an appropriate option as each has its own advantages and disadvantages. The US will be required to consider the merits of each and decide accordingly. In reaching a decision, the US is obliged to consider the social, environmental, economic, institutional and the regulatory milieu in which it finds itself. However, irrespective of the option chosen, current and pending legislation related to waste management requires the US to implement a waste information and (environmental) management system. Wastes are a tangible and explicit environmental impact. Implementing an EMS that includes a waste management system thus represents an obvious and tangible starting point to improve environmental performance and reduce environmental impacts (Van Zyl 1995). In addition, waste is measurable and hence improvements and progress can be easily monitored.

4.3 CURRENT WASTE MANAGEMENT SYSTEMS AT THE US

The US has waste management systems in place and it would make economic sense to capitalise on these systems. Assessments of these systems indicate they do not satisfy those of an EMS, nor do they satisfy the information requirements of pending legislation. The systems in place at the US are fragmented, and user specific. They

vary in scope, intention, application and complexity. The majority of divisions at the US surveyed do not possess a documented waste management system. This assumption is based on the lack of response received during the survey even after verbal request and reminder for the submission of such documentation. Two divisions submitted the required documentation. The Department of Microbiology submitted its documented waste management system. This system is limited to handling radioactive waste and is available on its Internet site. The Department of Plant Pathology submitted a copy of its laboratory safety guideline manual and its waste collection documentation system. These divisions, by virtue of the scientific, education and research nature of their primary activities, constantly utilize and generate hazardous substances and are hence aware of the inherent dangers that these pose. However, it is evident from these submissions and the conclusions derived from the survey, the scope of waste management at the US is restricted to waste as an instantaneous issue that only address the immediate storage and removal of waste. Little, if no evidence exists of waste minimisation or pollution prevention. The paradigm shifting “cradle-to-grave” concept of waste management is thus not evident at the US.

The majority of divisions at the US implement a rudimentary, organically developed waste management system that addresses only waste removal and collection. Two systems operate. A (implicit) general waste management system (i.e. that is integrated into the local authority’s waste removal programme) and a hazardous waste management system coordinated by USRPS. Even though the primary intention of these systems is deemed to be that of achieving administrative and financial efficiency in terms of waste removal, divisions were still unable to present accurate figures on the volumes of waste generated at the US. Therefore, this limited scope neither achieves the overall intention of policies and legislation, nor that of an EMS.

To adequately address these intentions, the vacuum created by the lack of an environmental policy at the US will have to be filled and in so doing, a real commitment to improving the environmental performance of the US as it relates to waste management will be realized. So too, will it’s strategic priority of effective and efficient resource utilisation be met.

CHAPTER 5: STUDY SYNTHESIS – CONCLUSIONS ABOUT WASTE

This chapter summarises the findings of the study in terms of its aims and provides recommendations to improve the current waste management practices at the US and for future research in this field. It concludes with an evaluation of the study.

5.1 SUMMARY OF RESULTS

The aims of this study were threefold, focussing mainly on portraying waste management practices and issues at the US.

5.1.1 Waste as a relevant research issue

This study has established the academic merits of waste as a relevant research issue, being applicable to the emerging interdisciplinary field of environmental management and “applied geography”. It contextualised the issues and concerns about waste as being a global one being inextricably linked to sustainable development and risk management. The global nature of these issues and concerns means the US is not alone. It exists within a particular milieu of institutions facing and challenging similar issues. In this regard, numerous responses that operate within the legislative and institutional domains have been developed to address these challenges. These responses and frameworks have been described in Chapter 2.

5.1.2 Waste management practices at the US

A situational assessment of waste management practices at the US is described in Chapter 3. The assessment is based on the research approach adopted. A variety of wastes have been identified, while the generating processes have been classified. An assessment of waste storage facilities, waste removal, waste disposal and minimisation has been undertaken and it has been determined that a complex disintegrated waste management system operates at the US. Co-ordination and integration of waste management exists for administrative and financial reasons. This approach is not congruent with contemporary environmental and waste management paradigms. Maps have been generated to display the spatial distribution of waste aspects at the US. The study has ascertained that limited reliable quantitative data for

waste exists. This presents a challenge for contemporary waste management practices and prohibiting such approaches from being easily adopted.

5.1.3 An environmental management perspective of waste management

This study has established the environmental context in which the US and the issue of waste are located. Chapter 4 describes contemporary environmental management frameworks that are applicable to the US, both in terms of managing its wastes while also addressing the globally recognised environmental crises. Numerous options are available for the US in this regard. The US may choose to only implement the waste management option, thus addressing this crucial aspect of its operation as it strives to utilise resources efficiently and effectively. Alternatively, it may choose to implement a broader EMS, the benefits of which are transversal and universal.

5.2 RECOMMENDATIONS

In terms of the findings of this study the following recommendation are suggested in terms of improving waste management practices at the US and in terms of future research in this field.

5.2.1 Improving waste management at the US

Waste management at the US has developed organically and is fragmented. A distinction between general and hazardous waste exists and is based on administrative and financial reasons. This distinction is therefore limited to traditional perceptions of waste and waste generating activities. It is recommended that an integrated approach to waste management be adopted as espoused in the WPIPWM. Regarding waste minimisation, the study has ascertained that its efficacy is hampered by structural factors, with insufficient incentives existing. These incentives relate not only to money but also to commitment in the absence of a waste management policy. Because no such policy exists the traditional and instantaneous management approach that requires waste to be disposed of as soon as possible is perpetuated. A challenge thus exists for the US to proactively address its management of waste or alternatively to be coerced into doing so by pending legislation. Attempts at improving this situation are admittedly underway as there exists a growing realisation that waste management needs to occur in an integrated manner. Individual divisions that have already commenced with such initiatives should be encouraged.

At this juncture in time, at the start of the new millennium, 10 years since the Earth Summit and with South Africa hosting the “World Summit on Sustainable Development” in 2002, it would be wise for US, as a global academic player, to address the management of its local environmental impacts, one of which is waste.

5.2.2 Opportunities for future research

The study has identified the following issues for future research:

- Regarding the issue of waste, a significant gap in the current information set is the volumes of waste generated by the US. This information is crucial should the US decide to implement any form of management system. This information will be required for comparative purposes, for benchmarking the process, monitoring progress and to facilitate proper budgeting;
- Innovative and interdisciplinary research opportunities involving the engineering and technology divisions emanate from the quest to identify and implement waste minimisation and resource recovery opportunities. The economics of such activities require further investigation;
- Compliance with legislation represents another important opportunity for future research, as this is mandatory. In this regard, a distinction will have to be made in terms of what is “geographically” and/or “environmentally” acceptable should this be undertaken under the auspices of the DGES;
- The spatial efficiency of waste storage and removal programmes require further research to facilitate proper budgeting and to maximise available resources;
- The choice of management systems and its suitability for the unique circumstances of the US requires further research. This may be combined with researching the requirements of the various university-related declarations. The applicable and available EMS’s and declarations require specific information. Researching these information requirements and implementing activities to achieve an acceptable environmental state, to enable signatory status of these declarations require research from a management and organisational perspective;

- The development of an environmental policy for the US requires thorough research and wide consultation, while its implementation will require an assessment of the US's organisational capabilities;
- The study has been limited to the Stellenbosch-based divisions of the US. In this regard, the study has also not surveyed all the divisions within the town of Stellenbosch, restricting itself to those divisions that occur within the central campus district. Additional divisions must still be researched. These include both the non-Stellenbosch based divisions (e.g. the Faculty of Medical Sciences, Military Sciences, Economic and Management Sciences) and other facilities and divisions based outside the central campus district (e.g. agricultural and forestry research facilities and the sports facilities); and
- In terms of utilising resources in an efficient and effective manner, further research is required to establish the full extent and value of resources utilised by the US. This approach may be modelled on the "ecological footprint" approach thus requiring the full environmental cost of the US to be determined. In this regard, research is required in terms of "full cost accounting" taking into account the natural capital demands of the US (including its demands on air, water and land etc.).

5.3 AN EVALUATION OF THE STUDY

This study has successfully been able to portray the complex nature of waste management at a diverse institution like the US, especially with regards to environmental management. It has established that there are significant information deficiencies in terms of waste information and has been unable to ascertain this information. The study has affirmatively contextualised the role of the US as an agent of sustainable development. Weaknesses of the study are that it was not exhaustive and as a result was geographically limited while the intensive use of a questionnaire resulted in detailed information being lost. The study was restricted by academic and administrative constraints and hence detailed investigations could not be afforded. Although it obtained a general assessment of waste management at the US, the research methodology limited the extent to which this system could be assessed and did not allow for an assessment of US management.

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APPENDICES

- A The study questionnaire
- B The Department of Labour: Labour legislation compliance checklist
- C The City of Cape Town: Publication of schedule of prohibited discharges into sewers and stormwater
- D Legislation affecting environmental concerns
- E The Talloires Declaration: University Presidents for a Sustainable Future
- F The Talloires Declaration: Signatories
- G Rhodes University environmental policy
- H The Halifax Declaration
- I The Swansea Declaration
- J The Kyoto Declaration
- K COPERNICUS: The University Charter for Sustainable Development
- L Association of University Leaders for a Sustainable Future: Membership Form
- M Association of University Leaders for a Sustainable Future: Sustainability Assessment Questionnaire (SAQ) for Colleges and Universities – October 1999 Draft Standard Form
- N The University of Stellenbosch: Risk Management Policy



UNIVERSITEIT VAN STELLENBOSCH
UNIVERSITY OF STELLENBOSCH

Augustus 2000

Hoofde van Departemente/Eenhede

OMGEWINGSBESTUUR AAN DIE UNIVERSITEIT VAN STELLENBOSCH

'n Groot en diverse organisasie soos die Universiteit laat 'n beduidende omgewingsvoetspoor agter deur die trefwydte en omvang van hulpbron-insette (bv. energie, water, chemiese en organiese stowwe) en die uiteindelijke beskikking van 'n wye verskeidenheid afvalprodukte wat in die omgewing teregkom. 'n Verskeidenheid wette en regulasies, maar ook goeie burgerskap, verplig instansies om verantwoordelikheid daarvoor te aanvaar, ook deur die formulering en implementering van 'n formele omgewingsbeleid. Die US se Risiko- en Beskermingsdienste is sentraal getaak hiervoor. Die Departement Geografie en Omgewingstudie verleen navorsingsteun deur 'n studie waarin die huidige afvalskeppings- en -hanteringspraktyke as deel van algemene omgewingspraktyk aan die US gemoniteer en afvalproduksie geklassifiseer en gekwantifiseer word, ook in die ruimtelike voorkoms daarvan oor die kampus. Die taak word ondervang in meestersgraad navorsing deur 'n Geografiestudent, Mnr A Mohamed, wat die verspreiding, voltooiing en verwerking van meegaande vraelys bestuur. Die vraelys word aan alle organisatoriese omgewingshoofde versprei met die versoek dat die relevante beamptes wat met die bestuur en hantering van afvalprodukte van enige aard gemoeid is, dit noukeurig sal invul. Die opname word onder beskerming van die Vise-reektor: Bedryf gedoen, sodat die resultate die Universiteit met die formulering van hanteringsstrategieë, asook toekomstige omgewingsbeleid, van hulp sal kan wees.

Dr JH van der Merwe tree as studieleier op en belangstellendes word uitgenooi om hulle te skakel indien enige onduidelikheid oor die opname sou opduik.

Baie dankie vir u samewerking

Dr JH van der Merwe
(Departement Geografie en Omgewingstudie)
(Tel. 3103/3108/3218; E-pos: jhvdm@maties.sun.ac.za)

Mnr Viljoen Van der Walt
(Hoof: Risiko- en Beskermingsdienste)

Dr J L Smith
(Vise-Rektor: Bedryf)

Complete the following Questionnaire / Voortol die volgende Vraelys:	Waste Types/Afvalsoorte		Generating Processes and Amounts / Produksie Prosesse en Hoeveelhede					Waste Storage Facilities / Afvalopslugplekke			
<p>Table / Tabel 1: Waste Characteristics / Afval Kenmerke</p> <p>Waste Types / Afval Tipes:</p> <p>Specify the typical wastes products generated / Spesifieer die tipiese afvalstowwe wat gegenereer word:</p> <p>Additional lists may be provided if required. / Voorsien aparte lys indien nodig.</p>	<p>(For each waste type listed enter the amount or quantity generated per rating, include the unit of measure. / Vir elke afval tipe wat aangedui is, spesifiseer die hoeveelhede per klas, sluit in die maatstaf)</p>		<p>(For each waste type listed enter the amount or quantity generated per generating process. / Vir elke afval tipe wat aangedui is, spesifiseer die hoeveelhede wat genereer is deur die volgende prosesse, sluit in die maatstaf)</p>					<p>(For each waste type listed indicate waste storage facility(ies). / Vir elke aangedui is, spesifiseer die afvalopslugplek(ke)</p>			
	Hazardous/ Gevaarlik	Non-hazardous/ Nie-gevaarlik nie	Administrative / Administratiewe	Teaching / Onderwys	Research / Navorsing	Operational / Bedryfs	Other/ Ander (please specify/ spesifiseer asb)	No Waste is Stored on site - waste is immediately disposed of / Geen afval word betoëre nie afval is onmiddellik verwyder.	Dedicated Waste Storage Facility (within Building)/ Afval opslugplek is in die gebou	Dedicated Waste Storage Facility (outside Building)/ Afval opslugplek is buite die gebou	
<p>A. Office Wastes / Kantoor Afval</p> <p>(e.g. paper, packaging, cardboxes etc / by papier, verpakking, papbokke ens.)</p>	1 2 3 4 5 6										
<p>B. Chemical Wastes / Chemiese Afval - Liquids/Vloeistowwe</p> <p>(e.g. liquid chemical substances, solvents, effluents, wastewater etc / by vloeibare chemiese afvalstowwe, chemiese sake oplosmiddels, afvalwater ens.)</p>	1 2 3 4 5 6										
<p>C. Chemical Wastes / Chemiese Afval - Solids/Vaste</p> <p>(e.g. solid/powder chemical compounds, residuals, dioxines etc / by chemiese chemiese oorblyfsels, basterke ens.)</p>	1 2 3 4 5 6										
<p>D. Gaseous Waste / Gas Afval</p> <p>(e.g. vapours, gases, smoke etc / by damp, gasse, rook ens.)</p>	1 2 3 4 5 6										
<p>E. Radioactive Waste/ Radioaktiewe Afval</p> <p>(e.g. exposed materials, samples and equipment etc. / by blootgestelde stowwe, monsters, toerusting ens.)</p>	1 2 3 4 5 6										
<p>F. Biological Waste / Biologiese Afval</p> <p>(e.g. plant and animal remains, carcasses, cultures, body fluids, waste products etc. / by plant en dier oorblyfsels, reste, monsters, liggaamke vloeistowwe, afvalprodukte ens.)</p>	1 2 3 4 5 6										
<p>G. Equipment / Toerusting</p> <p>(e.g. containers, utensils, syringes, needles, blades, glassware etc. / by houers, toerusting, uitrusting, naalde, lemme, glasgoed ens.)</p>	1 2 3 4 5 6										
<p>H. Other / Ander</p> <p>(please specify / spesifiseer asb)</p>	1 2 3 4 5 6										

Inspectors of the Department of Labour will be visiting workplaces to check the level of compliance with labour legislation. The following are some of the aspects the inspectors will be checking.

QUESTION	YES	NO
Are you registered with the Department of Labour with regard to the: <ul style="list-style-type: none"> • Compensation for Occupational Injuries and Diseases Act? (Compensation Fund) • Unemployment Insurance Act? (UIF) 		
Do you have a copy of the Occupational Health and Safety Act on the premises and is the Act available to the workers?		
Have you appointed Health and Safety Representatives?		
Have you established Health and Safety Committees in the workplace?		
Are you and your workers trained to recognise health and safety problems?		
• are moving parts like drive belts and chains guarded?		
• are chemicals used safely and stored in a safe place?		
• are emergency exits clearly marked and easily accessible?		
• are fire extinguishers accessible and serviced regularly?		
• are flammable material stored and used correctly, for instance not near fires?		
Do you have fully equipped first aid boxes on the premises?		
Electrical safety: <ul style="list-style-type: none"> • are there bare wires and uncovered plugs in the workplace? 		
Do you report injuries at work to the Department of Labour?		
Do you have clean and hygienic toilets and washing facilities provided for males and females		
Do you have an attendance register at your workplace?		

It is the employer's duty to provide a safe and healthy workplace. If you answered NO to any of the above, you have to rectify immediately. Failure to comply with the above constitutes a criminal offense. Workers should report unsafe or unhealthy conditions to their employer or the health and safety representative.

Please assist the inspectors of our Department when they visit your workplace.

Enquiries:

Tel.: (012) 309-4392 (012) 309-4408 (012) 309-4388 (012) 309-4385

The previous Provincial Notice P.N. 188/2001, Provincial Gazette Extraordinary 5730 dated Friday, 22 June 2001 is hereby withdrawn.

The Schedule of prohibited discharges to sewers and stormwater referred to in the City of Cape Town's Wastewater and Industrial Effluent By-law (P.N. 466/2000, Provincial Gazette Extraordinary 5582 dated 15 September 2001), is hereby published. — City Manager, City of Cape Town.

SCHEDULE

Prohibited discharge into sewers

Section A: General		Not less than	Not to exceed
1.	Temperature at point of entry	0 °C	40 °C
2.	Electrical conductivity		500 mS/m ³
3.	pH value at 25 °C	5.5	12.0
4.	Chemical oxygen demand		5 000 mg/l

Section B: Chemical substances other than Heavy Metals — maximum concentration		
1.	Settleable solids (60 minutes)	50 ml/l
2.	Suspended solids	1 000 mg/l
3.	Total dissolved solids at 105 °C	4 000 mg/l
4.	Chloride as Cl	1 500 mg/l
5.	Total sulphates as SO ₄	1 500 mg/l
6.	Total phosphates as P	25 mg/l
7.	Total cyanides as CN	20 mg/l
8.	Total sulphides as S	50 mg/l
9.	Total phenols as C ₆ H ₅ OH	50 mg/l
10.	Total sugars and starches as glucose	1 500 mg/l
11.	Oils, greases, waxes and fat	400 mg/l
12.	Sodium as Na	1 000 mg/l

Section C: Metals and inorganic content — maximum concentrations

Group 1		
1.	Iron as Fe	50 mg/l
2.	Chromium as Cr	10 mg/l
3.	Copper as Cu	20 mg/l
4.	Zinc as Zn	30 mg/l
Total collective concentration of all metals in Group 1 shall not exceed 50 mg/l.		

Section C: Metals and inorganic content — maximum concentrations

Group 2		
5.	Arsenic as As	5 mg/l
6.	Boron as B	5 mg/l
7.	Lead as Pb	5 mg/l
8.	Selenium as Se	5 mg/l
9.	Mercury as Hg	5 mg/l
10.	Titanium as Ti	5 mg/l
11.	Cadmium as Cd	5 mg/l
12.	Nickel as Ni	5 mg/l
Total collective concentration of all metals and inorganic constituents in Group 2 shall not exceed 20 mg/l.		

Section D: Prohibited radioactive materials

Any radioactive substances or isotopes of such nature or in such concentration as do not meet the requirements laid down by the Council for Nuclear Safety referred to in Section 24 of the Nuclear Energy Act (Act 93 of 1982), as amended.

Prohibited discharge to stormwater drainage systems

Substance/Parameter	General Limit	Special Limit
Faecal coliforms (per 100 ml)	1 000	0
Chemical oxygen demand (mg/l)	75*	30*
pH	5.5-9.5	5.5-7.5
Ammonia (ionised and un-ionised) as Nitrogen (mg/l)	3	2
Nitrate/Nitrite as Nitrogen (mg/l)	15	1.5
Chlorine as Free Chlorine (mg/l)	0.25	0
Suspended solids (mg/l)	25	10
Electrical conductivity (mS/m)	70 mS/m above intake to a maximum of 150 mS/m	50 mS/m above background receiving water, to a maximum of 100 mS/m
Ortho-phosphate as phosphorus (mg/l)	10	1 (median) and 2.5 (maximum)
Fluoride (mg/l)	1	1
Soap, oil or grease (mg/l)	2.5	0
Dissolved arsenic (mg/l)	0.02	0.01
Dissolved cadmium (mg/l)	0.005	0.001
Dissolved chromium (VI) (mg/l)	0.05	0.02
Dissolved copper (mg/l)	0.01	0.002
Dissolved cyanide (mg/l)	0.02	0.01
Dissolved iron (mg/l)	0.3	0.3
Dissolved lead (mg/l)	0.01	0.006
Dissolved manganese (mg/l)	0.1	0.1
Mercury and its compounds (mg/l)	0.005	0.001
Dissolved selenium (mg/l)	0.02	0.02
Dissolved zinc (mg/l)	0.1	0.04
Boron (mg/l)	1	0.5

* After removal of algae.

LEGISLATION
AFFECTING ENVIRONMENTAL CONCERNS

Stellenbosch University <http://scholar.sun.ac.za>

ACTS

- Durban Waterworks Consolidation (Private) Act, 24 of 1921
- Land Survey Act, 9 of 1927
- Sea-Shore Act, 21 of 1935
- Advertising on Roads and Ribbon Development Act, 21 of 1940
- Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 36 of 1947
- Rand Water Board Statutes (Private) Act, 17 of 1950
- Merchant Shipping Act, 57 of 1951
- Explosives, Act, 26 of 1956
- Mines and Works Act, 27 of 1956 (Regulations)
- Water Act, 54 of 1956
- State Land Disposal Act, 48 of 1961
- Aviation Act, 74 of 1962
- Fencing Act, 31 of 1963
- Territorial Waters Act, 87 of 1963
- Atmospheric Pollution Prevention Act, 45 of 1965
- Immovable Property (Removal or Modification of Restrictions) Act, 94 of 1965
- Medicine and Related Substances Control Act, 101 of 1965
- Housing Act, 4 of 1966
- Removal of Restrictions Act, 84 of 1967
- Physical Planning Act, 88 of 1967
- National Monuments Act, 28 of 1969
- Mountain Catchment Areas Act, 63 of 1970
- Subdivision of Agricultural Land Act, 70 of 1970
- Water Research Act, 34 of 1971
- Agricultural Produce Export Act, 51 of 1971
- National Roads Act, 54 of 1971
- Foodstuffs, Cosmetics and Disinfectants Act, 54 of 1972
- Hazardous Substances Act, 15 of 1973
- Sea Birds and Seals Protection Act, 46 of 1973
- International Health Regulations Act, 28 of 1974
- Lake Areas Development Act, 39 of 1975
- Expropriation Act, 73 of 1975
- Plant Improvement Act, 53 of 1976
- National Parks Act, 57 of 1976
- Financial Relations Act, 65 of 1976
- Health Act, 63 of 1977
- Road Transportation Act, 74 of 1977
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- National Building Regulations and Building Standards Act, 103 of 1977
- Petroleum Products Act, 120 of 1977
- Dumping at Sea Control Act, 73 of 1980
- Marine Traffic Act, 2 of 1981
- Prevention and Combating of Pollution of the Sea by Oil Act, 6 of 1981
- South Africa Transport Services Act, 65 of 1981 (Regulations)
- Alienation of Land Act, 68 of 1981
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- Agricultural Pests Act, 36 of 1983
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- Animal Diseases Act, 35 of 1984

- Forest Act, 122 of 1984
- Regional Services Councils Act, 109 of 1985
- International Convention for the Prevention of Pollution from Ships Act, 2 of 1986
- Provincial Government Act, 69 of 1986
- Sectional Titles Act, 95 of 1986
- Housing Act (House of Representatives), 2 of 1987
- Development Act (House of Representatives), 3 of 1987
- Housing Development Act (House of Delegates), 4 of 1987
- Rural Areas Act (House of Representatives), 9 of 1987
- Electricity Act, 41 of 1987
- International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties Act, 64 of 1987
- Fire Brigade Services Act, 99 of 1987
- Land Affairs Act, 101 of 1987
- Sea Fishery Act, 12 of 1988
- Road Traffic Act, 29 of 1989
- Environment Conservation Act, 73 of 1989
- National Policy for Health Act, 116 of 1990
- Minerals Act, 50 of 1991
- Physical Planning Act, 125 of 1991
- Abattoir Hygiene Act, 121 of 1992
- Occupational Health and Safety Act, 85 of 1993
- Constitution of the Republic of South Africa, 200 of 1993

ORDINANCES

Transvaal

- Local Government Ordinance, 17 of 1939
- Roads Ordinance, 22 of 1957
- Public Resorts Ordinance, 18 of 1969
- Division of Land Ordinance, 19 of 1973
- Nature Conservation Ordinance, 12 of 1983
- Town-Planning and Townships Ordinance, 15 of 1986

Cape

- Nature and Environmental Conservation Ordinance, 19 of 1974
- Municipal Ordinance, 20 of 1974
- Roads Ordinance, 19 of 1976
- Land Use Planning Ordinance, 15 of 1985

Natal

- Town Planning Ordinance, 27 of 1949
- Roads Ordinance, 10 of 1968
- Nature Conservation Ordinance, 15 of 1974
- Local Authorities Ordinance, 25 of 1974
- Prevention of Environmental Pollution Ordinance, 21 of 1981

Orange Free State

- Local Government Ordinance, 8 of 1962
- Roads Ordinance, 4 of 1968
- Nature Conservation Ordinance, 8 of 1969
- Townships Ordinance, 9 of 1969
- Dumping of Rubbish Ordinance, 8 of 1976

The Talloires Declaration: University Presidents for a Sustainable Future

Stellenbosch University <http://scholar.sun.ac.za>

We, the presidents, rectors, and vice chancellors of universities from all regions of the world are deeply concerned about the unprecedented scale and speed of environmental pollution and degradation, and the depletion of natural resources. Local, regional, and global air pollution; accumulation and distribution of toxic wastes; destruction and depletion of forests, soil, and water; depletion of the ozone layer and emission of "green house" gases threaten the survival of humans and thousands of other living species, the integrity of the earth and its biodiversity, the security of nations, and the heritage of future generations. These environmental changes are caused by inequitable and unsustainable production and consumption patterns that aggravate poverty in many regions of the world.

We believe that urgent actions are needed to address these fundamental problems and reverse the trends. Stabilization of human population, adoption of environmentally sound industrial and agricultural technologies, reforestation, and ecological restoration are crucial elements in creating an equitable and sustainable future for all humankind in harmony with nature. Universities have a major role in the education, research, policy formation, and information exchange necessary to make these goals possible.

The university heads must provide the leadership and support to mobilize internal and external resources so that their institutions respond to this urgent challenge. We, therefore, agree to take the following actions:

1. Use every opportunity to raise public, government, industry, foundation, and university awareness by publicly addressing the urgent need to move toward an environmentally sustainable future.
2. Encourage all universities to engage in education, research, policy formation, and information exchange on population, environment, and development to move toward a sustainable future.
3. Establish programs to produce expertise in environmental management, sustainable economic development, population, and related fields to ensure that all university graduates are environmentally literate and responsible citizens.
4. Create programs to develop the capability of university faculty to teach environmental literacy to all undergraduate, graduate, and professional school students.
5. Set an example of environmental responsibility by establishing programs of resource conservation, recycling, and waste reduction at the universities.
6. Encourage the involvement of government (at all levels), foundations, and industry in supporting university research, education, policy formation, and information exchange in environmentally sustainable development. Expand work with nongovernmental organizations to assist in finding solutions to environmental problems.
7. Convene school deans and environmental practitioners to develop research, policy, information exchange programs, and curricula for an environmentally sustainable future.

8. Establish partnerships with primary and secondary schools to help develop the capability of their faculty to teach about population, environment, and sustainable development issues.
9. Work with the UN Conference on Environmental and Development, the UN Environment Programme, and other national and international organizations to promote a worldwide university effort toward a sustainable future.
10. Establish a steering committee and a secretariat to continue this momentum and inform and support each other's efforts in carrying out this declaration.

[Jean Mayer, President and Conference convener Tufts University, U.S.A. | L. Avo Banjo, Vice Chancellor University of Ibadan, Nigeria | Robert W. Charlton, Vice Chancellor and Principal University of Witwatersrand, Union of South Africa | Michele Gendreau-Massaloux, Rector l'Academie de Paris, France | Augusto Frederico Muller, President Fundacao Universidade Federal de Mato Grosso, Brazil | Calvin H. Pimpton, President and Emeritus American University of Beirut, Lebanon | T. Navaneeth Rao, Vice Chancellor Osmania University, India | Stewart Saunders, Vice Chancellor and Principal University of Cape Town, Union of South Africa | David Ward, Vice Chancellor Canipinas, U.S.A. | Pablo Arce, Vice Chancellor Universidad Autonoma de Centro America, Costa Rica | Boonrod Binson, Chancellor Chulalongkorn University, Thailand | Constance W. Curris President University of Northern Iowa, U.S.A. | Adamu, Nayaya Mohammed Vice Chancellor Ahmadu Bello University, Nigeria | Mario Ojeda Gomez President Colegio de Mexico, Mexico | Wesley Posvar, President University of Pittsburgh, U.S.A. | Pavel D. Sarkisow, Rector D. I. Mendeleev Institute of Chemical Technology U.S.S.R. | Akilagpa Sawyerr, Vice Chancellor University of Ghana, Ghana | Carlos Vogt, President Universidade Estadual de Brazil | Xide Xie, President Emeritus Fudan University, People's Republic of China]

Thanks for providing this document go to: Heiko Weber

Talloires Declaration Signatories

December 2000
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Africa: 17 Asia & South Pacific: 29 Europe & Russia: 29
 Canada & USA: 93 Latin America & Caribbean: 108 Middle-East: 2

Countries Listed in Alphabetical Order

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Argentina

1. Universidad de Belgrano, Buenos Aires

Australia

1. Royal Melbourne Institute of Technology, Melbourne
2. University of Canberra
3. University of New South Wales, Sydney
4. University of Technology, Sydney
5. University of Western Sydney, Hawkesbury

Brazil

1. Fundacao de Ensino Superior de Sao Joao Del Rei, Sao Joao Del Rei
2. Fundacao Universidade Estadual de Maringa - FUEM, Parana
3. Fundacao Universidade Federal do Piau, Terezina
4. Fundacao Universidade de Pernambuco, Recife
5. Fundacao Universidade Reg. do Rio Grande do Norte, Mossoro
6. Fundacao Universidade do Rio Grande, Rio Grande
7. Institutos Paraibanos de Educacao, Paraiba
8. Pontifica Universidade Católica do Rio Grande do Sul, Porto Alegre
9. UNI-RIO, Rio de Janeiro
10. Universidade do Amazonas, Manaus
11. Universidade de Brasilia, Brasilia
12. Universidade de Fortaleza - UNIFOR Ceara
13. Universidade de Guaraulhos, Guaraulhos
14. Universidade Catolica de Goias, Goiania
15. Universidade Católica de Pernambuco, Recife

16. Universidade Católica do Salvador, Salvador-Bahia
17. Universidade do Estado de Santa Catarina, Florianopolis
18. Universidade Estadual de Campinas, Campinas
19. Universidade Estadual do Ceara - UECE, Ceara
20. Universidade Estadual de Feira de Santana, Feira de Santana
21. Universidade Estadual da Paraiba - UEPB, Campina Grande
22. Universidade Estadual Paulista - UNESP, Sao Paulo
23. Universidade Federal de Mato Grosso do Sul, Campo Grande
24. Universidade Federal do Acre, Rio Branco
25. Universidade Federal de Alagoas, Maceio
26. Universidade Federal do Ceara, Fortaleza
27. Universidade Federal Fluminense, Niteroi
28. Universidade Federal de Goias, Goiania
29. Universidade Federal do Maranhao, Sao Luiz
30. Universidade Federal de Mato Grosso, Cuiaba
31. Universidade Federal de Minas Gerais, Belo Horizonte
32. Universidade Federal Ouro Preto, Ouro Preto, MG
33. Universidade Federal do Para, Belem
34. Universidade Federal do Paraiba, Joao Pessoa
35. Universidade Federal do Parana, Curitiba
36. Universidade Federal de Pelotas, Pelotas
37. Universidade Federal do Rio de Janeiro, Rio de Janeiro
38. Universidade Federal Rural de Pernambuco, Recife
39. Universidade Federal Rural do Rio de Janeiro, Lepopedica
40. Universidade Federal do Rio Grande do Norte, Natal
41. Universidade Federal do Rio Grande do Sul, Rio Grande
42. Universidade Federal do Rondonia - UNIR, Porto Velho
43. Universidade Federal de Santa Maria, Santa Maria
44. Universidade Federal do Sao Carlos, Sao Carlos
45. Universidade Federal do Sergipe, Sergipe
46. Universidade Federal do Uberlandia, Uberlandia
47. Universidade Federal do Vicosa, Vicosa
48. Universidade Metodista de Piracicaba, Piracicaba, Sao Paulo
49. Universidade de Mogi das Cruzes - UMC, Mogi das Cruzes, Sao Paulo
50. Universidade de Pernambuco, Recife
51. Universidade do Sao Francisco, Braganca Paulista
52. Universidade do Sul de Santa Catarina, Tubarao

A ABC...

Bulgaria

1. University of National and World Economy, Sofia

Canada

1. Atlantic School of Theology, Halifax, Nova Scotia
2. Carleton University, Ottawa, Ontario
3. Concordia University, Montreal, Quebec
4. Dalhousie University, Halifax, Nove Scotia
5. Lakehead University, Thunder Bay, Ontario
6. McGill University, Montreal, Quebec
7. Mount Saint Vincent University, Halifax, Nova Scotia

8. Ryerson Polytechnical Institute, Toronto, Ontario
9. Saint Francis Xavier University, Antigonish, Nova Scotia
10. Saint Mary's University, Halifax, Nova Scotia
11. Saint Thomas University, Fredericton, NB,
12. Simon Fraser University, Burnaby, British Columbia
13. University of British Columbia, Vancouver, British Columbia
14. University College of Cape Breton, Sydney, Nova Scotia
15. University of Guelph, Guelph, Ontario
16. The University of Lethbridge, Lethbridge, Alberta
17. University of Manitoba, Winnipeg, Manitoba
18. University of Ottawa, Ottawa, Ontario
19. University of Saskatchewan, Saskatoon, Saskatchewan
20. University of Victoria, British Columbia
21. The University of Western Ontario, London, Ontario
22. University of Windsor, Windsor, Ontario

Chile

1. Universidad de Chile, Santiago
2. Universidad de Santiago de Chile

China

1. Fudan University, Shanghai
2. People's University of China, Beijing



Colombia

1. Colombian Politechnical "Jaime Isaza Cadavid" University, Bogotá
2. Corporación Universitaria Del Meta, Villavicencio
3. Environmental and Applied Sciences University (U.D.C.A.)
4. Escuela Superior de Administración Pública, Bogotá
5. Fundación Universidad de Bogotá, Jorge Tadeo Lozano, Bogotá
6. Fundación Universidad Incca De Colombia, Bogotá
7. Fundación Universitaria CEIPA, Medellín
8. Instituto Colombiano de Estudios Superiores de Incolda, Cali
9. Ministry of Development, Bogota*
10. Pontificia Universidad Javeriana, Bogotá
11. Universidad de la Amazonia, Leticia
12. Universidad de los Andes, Bogotá
13. Universidad de Antioqu'a, Medellín
14. Universidad Antonio Nariño, Bogotá
15. Universidad Católica de Colombia, Bogotá
16. Universidad Francisco de Frola Santander, Cucuta
17. Universidad de la Guajira, Rioacha
18. Universidad Industrial de Santander, Bucaramanga
19. Universidad de Magdalena, Santa Marta
20. Universidad Nacional de Colombia, Bogotá
21. Universidad del Quind'o, Quind'o
22. Universidad Pedagógica Nacional, Bogotá
23. Universidad Pedagógica y Tecnológica de Colombia, Tunja

24. Universidad Pontificia Bolivariana, Medellín
25. Universidad del Rosario, Bogotá
26. Universidad de la Salle, Bogotá
27. Universidad Tecnológica de Pereira, Pereira
28. Universidad del Tolima, Tolima
29. Universidad del Valle, Cali

Costa Rica

1. Autonomous University of Central América, San José
2. Universidad de Costa Rica, San José
3. Universidad Latina de Costa Rica, San José
4. Universidad Nacional, Heredia
5. Universidad para la Paz, Ciudad Colon

Czech Republic

1. Charles University, Prague



Ecuador

1. Escuela Politécnica Nacional

Finland

1. Mikkeli Polytechnic, Mikkeli

France

1. l'Academie de Paris, Paris
2. Universite Pierre et Marie Curie, Paris

Germany

1. Augsburg University, Augsburg

Ghana

1. University of Ghana, Legon

Greece

1. University of Athens, Athens

Hong Kong

1. The Chinese University of Hong Kong, Shatin
2. Hong Kong Baptist College, Kowloon
3. University of Hong Kong, Hong Kong

Hungary

1. Budapest University of Economic Sciences, Budapest

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India

1. Devi Ahilya University, Indore
2. Garu Nanak Dev University, Amritsar
3. Indian Statistical Institute, West Bengal
4. Indira Gandhi National Open University, New Delhi
5. Jawaharlal Nehru University, New Delhi
6. Manipur University, Manipur
7. North Maharashtra University, Jalgaon
8. Osmania University, Hyderabad
9. University of New Delhi, New Delhi

Italy

1. The University of Tuscia, Viterbo

Japan

1. Meijo University, Nagoya
2. Tokai University, Tokyo
3. Tokai University Educational System

Kenya

1. Kenya Marine and Fisheries Institute
2. Moi University, Eldoret
3. University of Nairobi, Nairobi

▲ ABC...

Lebanon

1. American University of Beirut, Beirut
2. University of Balamand, Tripoli

Malawi, University of Malawi System

1. Bunda College of Agriculture
2. Chancellor College, Zomba
3. Kamuzu College of Nursing
4. Medical College
5. The Polytechnic Institute

Malaysia

1. University of Malaya, Kuala Lumpur

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 3. El Colegio Mexiquense, A. C., Toluca, Edo
 4. El Colegio de Michoacan, A. C., Zamora
 5. El Colegio de Sonora, Hermosillo
 6. Universidad Juárez del Estado de Durango, Durango
 7. Universidad Nacional Autónoma de México, México City
 8. Universidad Regiomontana, Monterrey

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Nigeria

1. Ahmadu Bello University, Zaria
2. University of Ibadan, Ibadan

Paraguay

1. Universidad Católica Nuestra Señora de la Asunción, Asunción

Perú

1. Pontificia Universidad Católica Del Pero, Lima
2. Universidad Católica Santa María, Arequipa
3. Universidad Nacional de San Agust'n de Arequipa, Arequipa
4. Universidad Nacional de San Antonio Abad del Cusco, Cusco

Philippines

1. Cagayan State University, Cagayan
2. The University of Manila, Manila

A ABC...

Poland

1. AGH University of Minerals and Metallurgy, Krakow
2. University of Warsaw, Bialystok

Portugal

Puerto Rico

1. Ana G. Mendez University System
 - o Colegio Universitario Del Este
 - o Metropolitan University
 - o Turabo University
2. Universidad Interamericana de Puerto Rico, San Germán
3. University of Puerto Rico

A ABC...

Romania

1. University "Politehnica" Bucharest, Bucharest

Russia

1. Institute of Far Eastern Studies, Academy of Sciences, Moscow
2. Mendeleev Institute of Chemical Technology, Moscow
3. Perm State Technical University, Perm
4. University of Transportation, Petersburg

South Africa

1. Rhodes University, Cape Province
2. University of Cape Town, Cape Town
3. University of Natal, Durban
4. University of the Western Cape, Bellville
5. University of Witwatersrand, Johannesburg

South Korea

1. Hang Yang University, Seoul

A ABC...

Spain

1. Universidad Complutense, Madrid

Switzerland

1. Universite de Geneve, Geneve

Thailand

1. Chiang Mai University, Chiang Mai
2. Chulalongkorn University, Bangkok

Tunisia

1. Ecole Nationale D'Ingenieurs, Tunis

Turkey

1. Ankara University, Ankara

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United Kingdom

1. Liverpool John Moores University, Liverpool
2. Monkwearmouth College, Sunderland
3. University of Lancaster, Lancaster
4. University of Northumbria at Newcastle
5. University of Strathclyde, Strathclyde
6. University of Sunderland, Sunderland
7. University of Sussex, Brighton
8. World Wide Fund for Nature (WWF UK)*

United States

1. Alaska Pacific University, Alaska
2. American Re-Insurance Company, New Jersey*
3. Appalachian State University, North Carolina
4. Ball State University, Indiana
5. Blue Ridge Community College, Virginia
6. Bowling Green State University, Ohio
7. Brown University, Rhode Island
8. Cape Cod Community College, Massachusetts
9. Christopher Newport College, Virginia
10. Clark University, Massachusetts
11. Clemson University, South Carolina
12. Clinch Valley College, Virginia
13. College of the Atlantic, Maine
14. College of William & Mary, Virginia
15. Connecticut College, Connecticut
16. George Mason University, Virginia
17. The George Washington University, Washington, DC
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19. Hampden-Sydney College, Virginia
20. James Madison University, Virginia
21. Longwood College, Virginia
22. Macalester College, Minnesota
23. Mary Washington College, Virginia
24. Merrimack College, Massachusetts
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26. Mount Holyoke College, Massachusetts
27. Muhlenburg College, Pennsylvania
28. Norfolk State University, Virginia
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30. Northern Virginia Community College, Virginia

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32. Patrick Henry Community College, Virginia
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34. Piedmont Community College, Virginia
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36. Ramapo College, New Jersey
37. Randolph Macon College, Virginia
38. Rice University, Texas
39. Richard Bland College, Virginia
40. Rutgers University, New Jersey
41. Saint Thomas University, Florida
42. Southern Illinois University Carbondale, Illinois
43. Southern University and A&M College, Louisiana
44. State University of New York at Buffalo, New York
45. Sterling College, Vermont
46. Tri-County Technical College, South Carolina
47. Tufts University, Massachusetts
48. University of Arizona, Arizona
49. University of California, Santa Barbara, California
50. University of Colorado, Colorado
51. University of Florida, Florida
52. University of Georgia, Georgia
53. University of Hawaii, Hawaii
54. University of Massachusetts at Boston, Massachusetts
55. University of Nevada, Nevada
56. University of New Hampshire, New Hampshire
57. The University of North Carolina, North Carolina
58. University of Northern Iowa, Iowa
59. University of Pittsburg, Pennsylvania
60. University of Rhode Island, Rhode Island
61. University of Virginia, Virginia
62. University of Wisconsin-Madison, Wisconsin
63. Utah State University, Utah
64. Virginia Commonwealth University, Virginia
65. Virginia Community College System, Virginia
66. Virginia Military Institute, Virginia
67. Virginia State University, Virginia
68. Virginia Western Community College, Virginia
69. William Marsh Rice University, Texas
70. Xavier University of Louisiana, Louisiana

Vietnam

1. Institute of International Relations, Hanoi

Yugoslavia

1. University of Zagreb, Croatia

Zimbabwe

1. University of Zimbabwe, Harare

▲ ABC...

RHODES UNIVERSITY ENVIRONMENTAL POLICY

Goal | Aims | Objectives | The Talloires Declaration

In establishing an Environmental Policy for Rhodes University, the University recognises that its use of resources has an impact on the environment (socio-economic and physical). As a University that strives to meet internationally acceptable standards, Rhodes University should play a leading role within the Eastern Cape and South Africa in respect of environmental issues.

GOAL

The University will actively pursue a policy of environmental best practice in order to assist in creating an environmentally sustainable future.

AIMS

1. To include and improve the environmental components of curricula.
2. To provide opportunities for students to study campus and local environmental issues.
- 3. To conduct a campus environmental audit.
4. To implement an environmentally responsible purchasing and campus stores policy.
5. To reduce campus waste.
6. To improve hazardous waste identification and management on campus.
7. To maximise campus energy efficiency.
8. To encourage the planting of indigenous flora on campus.
9. To optimise and control the use of water on campus.

OBJECTIVES

I. Educational

Curricula

Rhodes University intends to enhance (increase and improve) the environmental content of curricula offered in all faculties at Rhodes University by:

1. Improving awareness amongst teaching staff around the environmental content of courses.
2. The inclusion of environmental issues in curricula where appropriate.
3. Promoting the environmental orientation of Rhodes for marketing and fund-raising purposes by producing suitable publicity.

Research

The University will commit itself to encouraging environmental research by

1. Encouraging students and staff to conduct environmental research on campus and in local areas (communities). Environmental audits could highlight possible environmental research issues.
2. Ensuring that research carried out at Rhodes is ethically and environmentally sound.
3. To establish a set of guidelines for research that could have a possible impact on the environment.
2. Resource Use

Waste

The University will aim to improve its management of both general and hazardous waste produced on campus by:

1. Minimising (reducing and /or recycling) wherever possible its solid and liquid waste streams at all discharge points on campus.
2. Using recycled products wherever feasible.
3. Adopting a purchasing policy sensitive to environmental concerns.
4. Identifying and minimising hazardous wastes on campus.
5. Ensuring satisfactory disposal of wastes (hazardous and general) that cannot be re-used or recycled.
6. Conducting a regular waste audit to assess improvement of waste management strategies on campus and to communicate these results to relevant parties.

Energy

The University will aim to maximise campus energy efficiency by:

1. Minimising and monitoring the total energy consumption.
2. Implementing wherever possible to best available energy technology for new buildings and in existing structures where possible.

Water

The University will aim to manage its water resources efficiently:

1. Minimising and monitoring the total water consumption.
2. Ensuring that water systems on campus are not wasteful.
3. Encouraging the planting of indigenous flora to reduce water usage.
3. Partnerships and Communication

Community Involvement

Through the implementation of the Rhodes University Environmental Policy it is important that partnerships are encouraged and formed between those directly associated with and affected by the actions of the University. This will be achieved by:

1. Approving and facilitating interactions and communications of the University's environmental actions between the University and members of the communities which surround its campuses and with which its staff interacts.

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2. Reporting annually on how environmental practices in the community have been addressed by the University.

Student Involvement

The University will encourage students to play an important role in the implementation, maintenance and assessment of the environmental policy by:

1. Increasing the ways in which students can participate in the policy implementation i.e. through research.
2. Ensuring policy implementation is fed back to the students via relevant media.
3. Reporting annually on how students have been involved in implementing the policy and assessing environmental issues on campus.

Management Involvement

The University management will:

1. Incorporate the environmental responsibility into its mission statement.
2. Continue to uphold the University's responsibilities as a signatory of the Talloires Declaration.
3. Ensure the implementation and monitoring of the environmental policy.
4. Ensure that the University community is aware of the policy and to communicate the results of the monitoring process.
5. Maintain an environment which is conducive to good scholarship and provides good working conditions.

The Talloires Declaration:

University Presidents for a Sustainable Future
Tufts University European Centre
Talloires
France

October 4-7, 1990

Background

Twenty-two Presidents, Rectors and Vice-Chancellors of Universities from all over the world convened at the Tufts European Centre in Talloires, France, from 4 to 7 October 1990, to discuss the role of universities and in particular, the role of university presidents in environmental management and sustainable development.

Assisted by internationally respected environmental leaders, the presidents explored the state of the natural environment, the impact of human population growth and economic activity on the environment and strategies for the future.

The presidents discussed the role of education, research, policy formation and information exchange in managing human impact on the environment. Since the majority of the presidents were from developing countries, concerns about resource depletion, poverty and the need for substantial assistance from developed countries received equal attention with local, regional and global pollution problems.

The Conference was organised and hosted by Tufts University President, Jeri Mayer and sponsored by grants from the Rockefeller Foundation, the US Environmental Protection Agency and the John D and Catherine T MacArthur Foundation. After a keynote address by Maurice Strong, secretary general of the United Nations Conference on Environment and Development (to be held in Brazil in June 1992), the presidents developed a series of recommendations which are summarised in this report. The Conference ended with

The presidents believe this conference is an important first step in engaging the considerable resources of universities to work toward an environmentally sustainable future. They pledge mutual support as they take actions at their own universities to implement the recommendations. They hope their deliberations will encourage other university leaders to initiate programs to prepare their graduates for the challenges of the twenty first century. They invite their colleagues to sign the declaration and

The Text of The Talloires

We, the Presidents, Rectors and Vice-Chancellors of universities from all regions of the world are deeply concerned about the unprecedented scale and speed of environmental pollution and degradation, and the depletion of natural resources. Local, regional and global air pollution; accumulation and distribution of toxic waste; destruction and depletion of forests, soil and water; depletion of the ozone layer and emission of "green house" gases threaten the survival of humans and thousands of other living

We believe that urgent actions are needed to address these fundamental problems and reverse the trends. Stabilization of human population, adoption of environmentally sound industrial and agricultural technologies, reforestation and ecological restoration are crucial elements in creating an equitable and sustainable future for all humankind in harmony with nature. Universities have a major role in the education, research, policy formation and information exchange necessary to make these goals possible.

The university heads must provide the leadership and support to mobilise internal and external resources so that their institutions respond to this urgent challenge. We, therefore, agree to take the following actions:

1. Use every opportunity to raise public, government, industry, foundation and university awareness by publicly addressing the urgent need to move toward an environmentally sustainable future.
2. Encourage all universities to engage in education, research, policy formation and information exchange on population, environment and development to move toward a sustainable future.

sustainable economic development, population and related fields to ensure that all university graduates are environmentally literate and responsible citizens.

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4. Create programs to develop the capability of university faculty to teach environmental literacy to all undergraduate, graduate and professional school students.

5. School deans and environmental practitioners to develop research, policy, information exchange programs and curricula for an environmentally sustainable future.

6. Establish partnerships with primary and secondary schools to help develop the capability of their faculty to teach about population, environment and sustainable development issues.

7. Work with the UN Conference on Environment and Development, the UN Environment Programme and other national and international organizations to promote a worldwide university effort toward a sustainable future.

8. Establish a steering committee and a secretariat to continue this momentum and inform and support each other's efforts in carrying out this declaration.

Jean Mayer, President and conference Convener, Tufts University, USA / Pablo Arce, Vice-Chancellor, Universidad Autonoma Centro America, Costa Rica / L.Ayo Banjo, Vice-Chancellor, University of Ibadan, Nigeria / Boonrod Binson, Chancellor, Chulalongkorn University, Thailand / Constance W. Curris, President, University of Northern Iowa, USA / Robert W. Charlton, Vice-Chancellor and Principal University of Witwatersrand, Republic of South Africa

Michele Gendreau-Massaloux, Recteur de l'Academie de Paris, France / Adamu, Nayaya Mohammed, Vice-Chancellor, Ahmadu Bello University, Nigeria / Augusto Frederico Muller,

President Fundacao Universidade Federal de Mato Grosso, Brazil/Mario Ojeda Gomez, President, Colegio de Mexico, Mexico / Calvin H. Plimpton, President and Emeritus, American University of Beirut, Lebanon / Wesley Posvar, President, University of Pittsburgh, USA / T Navaneeth Rao, Vice-Chancellor, Osmania University, India / Pavel D Sarkisov, Rector, D I Mendeleev Institute of Chemical Technology USSR / Stewart Saunders, Vice-Chancellor and Principal University of Cape Town, Republic of South Africa / Aki

The list of the Talloires signatories is to be found at:
<http://www.ulsf.org/about/tallosig.html>

Further Information:

Mr Mark Hazell
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THE HALIFAX DECLARATION

Stellenbosch University <http://scholar.sun.ac.za>

Human demands upon the planet are now of a volume and kind that, unless changed substantially, threaten the future well-being of all living species. Universities are entrusted with a major responsibility to help societies shape their present and future development policies and actions into the sustainable and equitable forms necessary for an environmentally secure and civilized world.

As the international community marshals its endeavors for a sustainable future, focused upon the United Nations Conference on Environment and Development in Brazil in 1992, universities in all countries are increasingly examining their own roles and responsibilities. At Talloires, France in October, 1990, a conference of university presidents from every continent, held under the auspices of Tufts University of the United States, issued a declaration of environmental commitment that has attracted the support of more than 100 universities from dozens of countries. At Halifax, Canada, in December 1991, the specific challenge of environmentally sustainable development was addressed by the presidents of universities from Brazil, Canada, Indonesia, Zimbabwe and elsewhere, as well as by the senior representatives of the International Association of Universities, the United Nations University and the Association of Universities and Colleges of Canada.

The Halifax meeting added its voice to those many others worldwide that are deeply concerned about the continuing widespread degradation of the Earth's environment, about the pervasive influence of poverty on the process, and about the unsustainable environmental practices now so widespread. The meeting expressed the belief that solutions to these problems can only be effective to the extent that the mutual vulnerability of all societies, in the South and in the North, is recognized, and the energies and skills of people everywhere be employed in a positive, cooperative fashion. Because the educational, research and public service roles of universities enable them to be competent, effective contributors to the major attitudinal and policy changes necessary for a sustainable future, the Halifax meeting invited the dedication of all universities to the following actions:

1. To ensure that the voice of the university be clear and uncompromising in its ongoing commitment to the principle and practice of sustainable development within the university, and at the local, national and global levels.
2. To utilize the intellectual resources of the university to encourage a better understanding on the part of society of the inter-related physical, biological and social dangers facing the planet Earth.
3. To emphasize the ethical obligation of the present generation to overcome those current malpractices of resource utilization and those widespread circumstances of intolerable human disparity which lie at the root of environmental unsustainability.
4. To enhance the capacity of the university to teach and practise sustainable development principles, to increase environmental literacy, and to enhance the understanding of environmental ethics among faculty, students, and the public at large.
5. To cooperate with one another and with all segments of society in the pursuit of practical capacity-building and policy measures to achieve the effective revision and reversal of those current practices which contribute to environmental degradation, to South-North disparities and to inter-generational inequity.
6. To employ all channels open to the university to communicate these undertakings to UNCED,

to governments and to the public at large.

7. Done at Dalhousie University, Halifax, Canada, the 11th day of December, 1991.

- Background information
- Action Plan
- Recommendations
- From December, 9-11, 1991, the presidents and senior representatives of 33 universities from 10 countries on 5 continents met in Halifax, Canada to take stock of the role of universities regarding the environment and development. They were joined by a number of senior representatives from business, the banking community, governments, and non governmental organizations. The meetings were sponsored by the International Association of Universities, the United Nations University, the Association of Universities and Colleges of Canada, and Dalhousie University, Canada, which also provided the detailed planning and secretariat support. The Halifax Declaration was released at the conclusion of the conference.

From: Ayub Mohamed <ayub@mweb.co.za>
To: <amohamed@pawc.wcape.gov.za>
Date: 1/1/01 2:51PM
Subject: THE HALIFAX DECLARATION BACKGROUND

Stellenbosch University <http://scholar.sun.ac.za>

THE HALIFAX DECLARATION BACKGROUND

THE HALIFAX DECLARATION BACKGROUND

From: Creating a Common Future: An Action Plan for Universities. Follow up to the Halifax Conference on University Action for Sustainable Development, December 9-11, 1991. Halifax : Lester Pearson Institute for International Development, Dalhousie University, 1992.

University presidents and senior officials from universities, governments, the business community and NGOs from five continents met in Halifax, Canada in December, 1991 to discuss the role of universities in improving the capacity of countries to address environment and development issues.

An important and somewhat similar process had been initiated at the Tufts European Centre in Talloires, France in October, 1990. It had become clear to the Halifax conference organizers that the UNCED meetings, planned for Rio de Janeiro in June 1992, must be widely seen to be a catalyst for serious efforts to steer the world towards sustainable development patterns. It was also clear that the university community must be challenged to re-think and to re-construct many of its traditional activities and frameworks in order to play a leadership role in a world at serious risk of irreparable environmental destruction.

The conference was organized by the Association of Universities and Colleges of Canada, the International Association of Universities, the United Nations University, and Dalhousie University. Support was received from the Department of External Affairs and International Trade Canada, the Canadian International Development Agency, and the Province of Nova Scotia. Mr. Ivan Head, past President of the International Development Research Centre (IDRC) served as conference chairman. Among those delivering key-note addresses were the Hon. Jean Charest, Minister of the Environment, Canada; Professor Walter Kamba, President of the I.A.U. and Vice Chancellor of the University of Zimbabwe; and Mr. John Bell, chair of the Canadian Delegation to UNCED.

In readiness for the conference at Rio, key papers from the conference are being published in a special issue of Higher Education Policy, the journal of the International Association of Universities. The detailed proceedings of the conference are being published by Dalhousie University and will be available, upon request, on May 1, 1992.

... Two essential outcomes of the Halifax conference:

A follow-up plan of action, as a basis for practical strategic plans for sustainable development -- details of which are now being refined and pursued by many of the universities represented in Halifax and by their 'converts'. Emphasis is to be placed on concrete actions at home as well as a vigorous and strategic use of world-wide networks.

A Declaration, done at Halifax, which provides a general direction being pursued by the universities now involved. Emphasis is to be placed on education and training, on research and policy information, on far more weight on the value of inter-disciplinary work and on a pro-active role by universities for sustainable development.

Those in attendance at the Halifax conference believe the UNCED process to be a critical step towards an environmentally sustainable future and pledge their support. They invite their colleagues in other universities and institutions to help ensure the long-term success of the UNCED challenge to create a sustainable and more equitable world.

From: Ayub Mohamed <ayub@mweb.co.za>
To: <amohamed@pawc.wcape.gov.za>
Date: 1/1/01 2:52PM
Subject: AN ACTION PLAN FOR UNIVERSITIES

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AN ACTION PLAN FOR UNIVERSITIES
AN ACTION PLAN FOR UNIVERSITIES

From: Creating a Common Future: An Action Plan for Universities. Follow up to the Halifax Conference on University Action for Sustainable Development, December 9-11, 1991. Halifax : Lester Pearson Institute for International Development, Dalhousie University, 1992.

This plan 'model' is strategic in approach --not detailed. It is intended to provide a clear sense of direction for a number of core activities to which many others may be added and, of course, from which some may be subtracted. Examples of other possible activities which originated at the conference appear in the recommendations which follow this plan.

This plan outline identifies short- and long-term goals at the local and regional, national, and international levels. The short-term goals are those to be effected between December 12, 1991 and June, 1992; the longer-term goals are those which continue past the June 1992 UNCED Conference. While this preliminary plan focuses on the period leading up to the UNCED Conference, it also examines some mechanisms for designing longer term strategies.

- 1.. LOCAL - REGIONAL FRAMEWORK
- 2.. NATIONAL FRAMEWORK
- 3.. INTERNATIONAL FRAMEWORK
1. LOCAL - REGIONAL FRAMEWORK

The local-regional framework comprises actions which may be instituted within the university itself, and those which require that the university interact within the geographic region where it is situated.

Within the university itself, the following actions might be considered in the short-term: Unit/focal Point Identification: the first step recommended is to identify a unit or focal point responsible for developing a sustainable development strategy for the university. Minimally the unit/focal point would be an individual: ideally the unit should be a small task group linked clearly to an administrative unit in the university for support purposes. The unit must work comfortably across the university system --so the working style will be important. It should not be a new centre or bureaucratic body: it is simply to be seen as a small task force to help refine and launch these initiatives. The president of the university should work closely with this unit to demonstrate personal commitment to the process.

University Sustainable Development Strategy: It is suggested that within two months of establishment, the sustainable development unit should have completed an initial sustainable development strategy for its particular university (i.e. by March 31, 1992 at the latest). The emphasis should be on actions and results -- not on lengthy papers.

Such a strategy could have two time frameworks:

- 1.. up to June 1992;
- 2.. longer-term. Some longer-term, outputs can/should be started before June, 1992. A more refined strategy can be designed in the later period (e.g. April - August 92).

3..

4.. Practical Tasks: It is suggested that, in the initial strategy, a number of clear and operationally defined tasks be identified. For the shorter-term, each university strategy might include the following eight activities:

5.. A meeting between the president and senior management of the university to explain the conference and its outcome and to distribute copies of the key conference papers (including the Halifax Declaration and this follow-up strategy). The group would determine the best approach for follow-up in their particular university. It is suggested this be undertaken in January, 1992. The Board of Governors and also Senate should, it is suggested, be informed of the process underway and the proposed university specific strategy should be tabled at senate, once it is drafted.

6.. A meeting between the president and other university presidents within the province/state/region should be arranged to explain the conference outcome to those not represented and to encourage them to endorse the Halifax Declaration and to participate in this process. Some regional mechanisms for follow-up might well occur and should be encouraged. It is suggested this should be undertaken in January 1992. Obviously it can be added to the agenda of routine meetings.

7.. Each university represented (and endorsing the Halifax Declaration) might organize at least one substantial public presentation on sustainable development and the challenge represented by UNCED, at which time reference should also be made by the organizers to this process. The focus should be on the challenge and content of sustainable development, not narrowly on the process of UNCED itself. The sessions might include panelists from several disciplines (sciences, law, social sciences, arts). Obviously the more ambitious the event(s) the better -- but since this should not be viewed as a single event, but the start of a process, it is important to make a beginning. The suggested initial session is before the end of March, 1992, so a maximum number of students can participate.

8.. Each university might encourage faculty to review their course curricula and also their research agendas to see how sustainable development might best be integrated in and between disciplines. This should not be introduced in a "threatening" way. Special workshops for faculty on sustainable development ideas might be considered as one way of approaching the situation. (To be started before June, 1992.)

9.. Each university might sponsor a series of university prizes in sustainable development, linked to UNCED. They could be for papers contributed by students and also by faculty from any discipline.

10.. Each university might review all university linkage projects to explore how sustainable development elements are being or might be addressed.

11.. Each university might undertake a review of its own "sustainable development" impact on the region, e.g. from recycling paper to "green architecture". This goes beyond a narrow tradition of "environmental audit", to include a proactive dimension.

12.. Each university might participate in a "Sustainable Development Day", linked to UNCED in June, 1992.

These eight activities only represent a starting approach. Obviously the sustainable development units in each university might add new activities, drawing from the Recommendations for Follow-Up to this strategy and adding to it also.

13.. Within each university in the long term: Proposals for the longer-term are not identified in this strategic plan, but a number of ideas are listed in the Recommendations for Follow-Up. A longer-term strategic plan for sustainable development should be identified as an outcome of the work of the particular university units for sustainable development and their work. A representative task force from these universities could be set up to design the draft for a longer-term strategy to be completed by May 31, 1992 (in advance of UNCED). It could be along the lines of this initial plan, i.e. some eight or so strategic steps, with additional recommendations in an annex that can be routinely enlarged upon as ideas are exchanged within the network of universities. The strategic steps are likely to include curricula and teaching steps, new or reinforced research programmes across disciplines, inter-university linkage arrangements, new approaches with NGOs and governments, etc.

With respect to the interaction of the university and the local region in the short-term each university might undertake the following:

14.. University presidents and representatives from the sustainable development units might meet with the Minister of the Environment of their province to brief the Minister on the process underway. Similar meetings could be held with appropriate representatives of chambers of commerce, NGOs, federal departments, municipal governments. The precise mechanism would vary from province to province; for example, while the initial meeting with the responsible minister would be a special meeting, the other meetings could be through the mechanism of adding the subject to appropriate conferences that are already being organized, at lunch-time speeches that the presidents may already be scheduled to give to Chambers of Commerce, and so on.

15.. Each university might arrange to give a series of talks in schools on sustainable development and UNCED.

16.. Each university might work with the Citizens Support Programme, linked to the Ministry of the Environment and UNCED, in order to contribute ideas and help make it effective.

17.. Each university might meet with local NGOs to see how they can work effectively together for sustainable development (e.g. see the ideas in the Recommendations for Follow-Up re: possibilities in cooperation with the Red Cross).

18.. Each University might meet with representatives of key sectors in the province (e.g. banks, forest industry representatives) to work out ways to cooperate for sustainable development

19.. Each university might meet with local town/city councils to see how they might cooperate in support of sustainable development.

20.. [Action Plan | The Halifax Declaration] 2. NATIONAL FRAMEWORK

The national framework comprises both actions within the national university community, and the role of the universities within the national fabric.

Within the national university community, in the short-term where there are overall bodies representative of the national community of universities, they might be encouraged to establish a sustainable development advisory group which would comprise a mix of university presidents and members of the sustainable development units. The groups should meet by March 1992 at the latest, to review progress at the national level – following up on the Halifax Conference and preparing both for UNCED and for a longer-term sustainable development national university-wide strategy. This could be an integrative process linked clearly with the various university strategies for sustainable development.

A list of possible shorter and longer-term outputs appears in the Recommendations for Follow-Up, from which to make a start. In the Canadian context, the body responsible for this work will presumably be the AUCC. In the case of Canada, the secretariat of the AUCC will be drafting a preliminary set of goals and strategic plan for the AUCC regarding sustainable development.

With respect to the role of the universities within the nation, in the short-term, both individually and through the appropriate national body (e.g. AUCC), the universities might draw up a number of activities in support of sustainable development at the national level:

Four particular activities are suggested:

1.. Work with the national (Canadian) delegation for UNCED, preparatory to UNCED.

2.. Review the key public policy documents on sustainable development and write critiques of them both to assist the sponsor (e.g. CIDA) and by way of encouraging public awareness and interest

3.. Support national citizen participation programmes through the provision of skills and advocacy.

4.. Approach the national media services (e.g. CBC) to identify practical ways the universities can contribute to national programmes on sustainable development.

A longer-term strategy will need to be prepared by the national bodies (e.g. AUCC).

5.. [Action Plan | The Halifax Declaration]

3. INTERNATIONAL FRAMEWORK

At the international level, universities in the short-term, could take the following actions:

1.. Support the President of the IAU, in cooperation with UNU, to represent the international university community at UNCED.

2.. Establish an appropriate international council for sustainable development linked coherently to the IAU. IAU to draft a proposed mandate, in cooperation with UNU and Halifax Conference organizers.

3.. Endorse the idea and assist the Rector of the University of Rio de Janeiro in his proposal to organize a parallel university conference to UNCED

4.. Push to have environmental education placed higher on the UNESCO agenda.

5.. Promote the concept that a major international prize in sustainable development be initiated.

6.. Build sustainable development concepts into all the international linkage programmes of those universities present and signatories to the Halifax Declaration drawing upon the key principles found in the EMDI model, insofar as these are appropriate. Develop new programmes in sustainable development between the universities at the conference.

A longer-term strategy will need to be prepared – presumably the proposed international council might be responsible for this and it would build on the UNCED lessons.

7.. [Action Plan | The Halifax Declaration]

From: Ayub Mohamed <ayub@mweb.co.za>
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Subject: THE HALIFAX DECLARATION RECOMMENDATIONS

Stellenbosch University <http://scholar.sun.ac.za>

THE HALIFAX DECLARATION RECOMMENDATIONS
THE HALIFAX DECLARATION RECOMMENDATIONS

From: Creating a Common Future: An Action Plan for Universities. Follow up to the Halifax Conference on University Action for Sustainable Development, December 9-11, 1991. Halifax : Lester Pearson Institute for International Development, Dalhousie University, 1992.

These ideas were put forward by persons attending the conference and are not ranked, nor were they formally ratified by the conference.

- 1.. Local
- 2.. Regional
- 3.. National
- 4.. International

- 5..
- 6.. A. Within each university, activities could include:
- 7.. identifying a unit focal point on campus to be responsible for developing a sustainable development strategy for the university;

- 8.. completing an initial sustainable development strategy for the university by the sustainable development unit within two months of establishment;

- 9.. a meeting between the president and senior management of the university to explain the Halifax UASD Conference;

- 10.. organizing at least one public panel presentation on the challenge and content of sustainable development and how this relates to UNCED;

- 11.. a commitment to encourage faculty to review curricula to see how sustainable development concepts might be integrated into their courses. Some form of support seminar may be necessary for this idea to work;

- 12.. sponsoring prizes in sustainable development linked to UNCED. These might be for students, faculty, and administration;

- 13.. examining all university linkage projects to explore how sustainable development elements might be infused;

- 14.. conducting an environmental audit of the university;

- 15.. participation in a Sustainable Development Day linked to UNCED in June, 1992. Universities around the world could ideally agree on the same date;

- 16.. examining the university in the context of the Green Plan (or comparable documents in other countries);

- 17.. examining existing research programs to see how they might contribute more to sustainable development imperatives;

- 18.. endorsing the Talloires declaration;

- 19.. the distribution of the Nova Scotia Round Table on Environment and Economy and the Tufts University papers dealing with education and curriculum development (or comparable documents) to students and faculty for comment and response;

- 20.. designing new and collaborative environment and sustainable development research projects involving faculty and students;

- 21.. meetings with faculty, students, and the Board of Governors to respond to the challenge of how the university will deal with the sustainable development;

- 22.. increasing the number of fellowships for students from developing countries to study in Canada;

- 23.. encouraging innovative educational technologies for communicating environmental issues;

- 24.. developing more partnerships with business and industry for sustainable development;

- 25.. developing more partnerships with NGOs in order to learn about their work with sustainable development and also as a means of contributing to it. Some examples, using the Red Cross and Red Crescent as a model, might include:
 - 1.. exploring cooperation with national and international Red Cross or Red Crescent societies and then linking university research to support the societies' field operations for sustainable development,
 - 2.. exploring methods of twinning university projects with Red Cross or Red Crescent societies' projects to see how they can reinforce each other,
 - 3.. helping reinforce South/South cooperative projects with the Red Cross/Crescent. This is a Red Cross priority approach and is frequently put into practice,
 - 4.. linking some centers of excellence with Red Cross/Crescent centres of strength, e.g. the Bangladesh cyclone centers and early warning systems; Finnish Red Cross blood bank and research; several disaster preparedness centres which are linked to sustainable development, such as in Ethiopia,
 - 5.. supporting research, advocacy, and training into- the ever-growing plight of refugees, working with the Red Cross/Crescent or UNHCR,
 - 6.. encouraging faculty to be available for front-line environment project work with the Red Cross for which advice is frequently needed,
 - 7.. cooperating with the Red Cross in such fields as women and sustainable development and bringing the handicapped more fully into society,
 - 8.. cooperating with the Red Cross/Crescent to provide training for sustainable development to persons willing to work as Red Cross/Crescent volunteers.

- 26..
- 27.. publicizing the student winners of the Globe '92 Environmental Audit Competition and supporting annual event among Canadian universities;
- 28.. encouraging university libraries to purchase more documents written or published in the South;

- 29.. examining the realignment of existing academic units to address sustainable development while at the same time not compartmentalizing the theme;

- 30.. building more South/North research projects as a means of learning about sustainable development from both perspectives;

- 31.. enabling and encouraging more South/South cooperation in linkage projects;

- 32.. developing teaching teams to serve as models for interdisciplinary research;

- 33.. fostering two-way exchanges of personnel to promote capacity building for sustainable development;

- 34.. establishing chairs in sustainable development and sponsoring links between universities for sharing speakers in this field;

- 35.. designing continuing education programs with respect to environmental issues for NGOs, public

service units, and businesses;

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- 36.. designing an environmental literacy program that would be widely available and encouraged;
- 37.. meeting with local town and city councils to see how they might cooperate in support of sustainable development;
- 38.. developing forums for awareness and information exchange, education, and public debate;
- 39.. designing interdisciplinary seminars which examine a sample of university linkages from the point of view of sustainable development;
- 40.. encouraging leading issue research programs and teaching orientations that foster inter-disciplinary work;
- 41.. supporting a network on universities and sustainable development within the region;
- 42.. encouraging outward bound sustainable development projects that reach across the university and into the regions where the university is situated;
- 43.. establishing a prestigious prize to encourage far-reaching analysis and thought on sustainable development;
- 44.. funding scholarships in sustainable development;
- 45.. forming think-tanks, with people drawn from government, industry, and academe to examine the interaction of sustainable development with particular disciplines;
- 46.. examining appropriate technology and recognize that to be "appropriate" technology must be environmentally sound, economically viable, and relevant in the social context;
- 47.. assessing community needs for environmental information, assessment, and technology transfer and seeing how university programs might respond;
- 48.. examining the Environmental Management Development in Indonesia Project model for its application to linkages;
- 49.. developing fund raising methods for sustainable development to determine the applicability of innovative approaches, such as debt-for-nature swaps, developed by organizations like Conservation International;
- 50.. reviewing all linkage programs to see how sustainable development elements can be injected;
- 51.. adjusting the university reward system to account for community service and outreach as a balance for other criteria for tenure and promotion;
- 52.. examining how indigenous knowledge might be given greater weight in curricula;
- 53.. giving a series of talks in school on sustainable development and UNCED;
- 54.. specifying multi-disciplinary research as an area which requires extensive support;
- 55.. building more multi-disciplinary teams to tackle environmental concepts and issues;
- 56.. accessing state-of-the art curriculum on sustainable development and circulating it;
- 57.. building twinning relationships with institutions in twinned cities;
- 58.. encouraging urban issues as areas for teaching and research while at the same time not neglecting the rural;

59.. including alumni in efforts to address sustainable development;

- 60.. involving chambers of commerce in the university's efforts to address sustainable development;
- 61.. working with faculty and students to develop sustainable development strategies, policies, and action plans;
- 62.. tasking key faculty members to feed sustainable development through the university system;
- 63.. involving government, business, and NGOs in the university's efforts to address sustainable development;
- 64.. involving students in the university's linkage projects both at home and in the host country;
- 65.. Listing sustainable development expertise on campus such as was done at the University of Manitoba;
- 66.. developing a strategic plan for sustainable development within the university;
- 67.. preparing a manual on "Sustainable Development in Universities"; other publications could include "How Universities can work with NGOs in Contributing to Sustainable Development";
- 68.. preparing a mission statement which articulates a commitment to the environment and general environmental principles;
- 69.. preparing an advisory paper to encourage and guide graduate students on how they might link their thesis subjects to the goals of UNCED;
[The Halifax Recommendations | The Halifax Declaration]
- 70.. B. Within the Region, university activities could include:
 - 71..
 - a.. encouraging universities which were not at the conference to participate in the process and to endorse the Halifax Declaration;
 - b.. having the presidents and the sustainable development unit representatives of universities in the region meet with the provincial Minister of the Environment to discuss mutual goals;
 - c.. establishing a network among universities in order to share information about the "Greening" of the universities: this could be linked to the national university network.
[The Halifax Recommendations | The Halifax Declaration]
 - d.. C. On a National Level, university activities could include:
 - e.. the establishment of a sustainable development advisory group within bodies representative of a national community of universities to review progress at the national level;
 - f.. working with the national delegation for UNCED preparatory to the conference;
 - g.. reviewing key public policy documents on sustainable development;
 - h.. supporting national citizen participation programs;
 - i.. approaching national media services to identify practical ways the universities can contribute to national programs on sustainable development;
 - j.. seeking to have universities play a more central role in strategic planning and decision making with respect to capacity building;
 - k.. encouraging governments to identify strategic plans for capacity building;
 - l.. circulating to students through the national university association the Youth Declaration on

Environment and Development;

m.. establishing a national university network to be linked to the national university association;
[The Halifax Recommendations | The Halifax Declaration] Stellenbosch University <http://scholar.sun.ac.za>

n.. D. At the International Level, university activities could include:
o.. providing support for the president of the IAU, in cooperation with UNU, to represent the international university community at UNCED;

p.. establishing an international council for sustainable development linked to the IAU; IAU to draft a proposed mandate in cooperation with UNU and Halifax Conference organizers;

q.. pushing to have environmental education placed higher on the UNESCO agenda;

r.. promoting a "Brundtland" prize or some distinguished international prize in sustainable development;

s.. building into all the international linkage programs of those universities present and signatories to the "Halifax Declaration", a sustainable development component and drawing upon the key principles found in the EMDI model insofar as they are appropriate;

t.. circulating the "Halifax Declaration" and "Plan of Action" as widely as possible, in different languages, to university organizations at the national, regional and international levels, appropriate NGOs including youth organizations, relevant UN. bodies, and the mass media;

u.. increasing interaction between the university community and those UN organizations concerned with sustainable development such as UNU, UNESCO, and UNEP;

v.. encouraging international agencies to use their requirements for information and policy development to build up local capacity in the universities;

w.. encouraging government to assign a percentage of external aid funding for basic education and training in sustainable development;

x.. for the countries represented at the UASD Conference, Zimbabwe, Brazil, Indonesia and Canada, forming a partnership for cooperation for sustainable development;

y.. accepting the offer of the Brazilian rectors to attend the pre-UNCED Academic Scientific Parallel Conference and have the Brazilian rectors also put forward the view of the universities, in addition to the IAU presentation.

THE SWANSEA DECLARATION

(released at the conclusion of the Association of Commonwealth Universities' Fifteenth Quinquennial Conference, August 1993, Swansea, Wales).

Human demands upon the planet are now of a volume and kind that threaten the future well being of all living species. Universities have a major responsibility to help societies shape their present and future development policies and actions into the sustainable and equitable forms necessary for an environmentally secure and civilized world.

As the international community marshals its endeavours for a sustainable future, following upon the United Nations Conference on Environment and Development in Rio de Janeiro in 1992, and its adoption of Agenda 21, the United Nations' Programme of Action aimed at reconciling the twin requirements of a high quality environment and a healthy economy for all peoples of the world, universities in all countries are increasingly examining their own roles and responsibilities. At Talloires, France in October 1990, a conference of university presidents from every continent, held under the auspices of Tufts University of the United States, issued a declaration of environmental commitment that has attracted the support of more than 100 universities from dozens of countries. At Halifax*, Canada in December 1991, the specific challenge of environmentally sustainable development was addressed by the presidents of universities from Brazil, Canada, Indonesia, Zimbabwe and elsewhere, as well as by the senior representatives of the International Association of Universities, the United Nations University and the Association of Universities and Colleges of Canada.

At Swansea, Wales, in August 1993, participants in the Association of Commonwealth Universities (ACU) 15th Quinquennial Congress drawn from over 400 universities in 47 different countries met to address the challenge of "People and the Environment - Preserving the Balance". They engaged in a quest for the ways by which the universities of the ACU, their leaders, scholars and students might engage and deploy their unique common traditions and comity to respond appropriately to this challenge.

The Swansea meeting inspired by the examples of Talloires and Halifax, and disappointed by the insufficient University presence at Rio de Janeiro and in Agenda 21, added its voice to those many others worldwide that are deeply concerned about the widespread degradation of the Earth's environment, about the pervasive influence of poverty on the process and the urgent need for sustainable practices. The participants expressed the belief that solutions to these problems can only be effective to the extent that the mutual vulnerability of all societies, developed and developing, is recognized, and the energies and skills of people everywhere be employed in a positive, co-operative fashion. Because the educational, research and public service roles of universities enable and impel them to be competent, effective contributors to the major additudinal and policy changes necessary for a sustainable future, the Swansea meeting invited thoughtful consideration by all universities of the following actions:

1. To urge universities of the ACU to seek, establish and disseminate a clearer understanding of sustainable development - "development which meets the needs of the present without compromising the needs of future generations" - and encourage more appropriate sustainable development principles and practices at the local, national and global levels, in ways consistent with their missions.
2. To utilise resources of the university to encourage a better understanding on the part of governments and the public at large of the inter-related physical, biological and social dangers facing the planet Earth, and to recognize the significant interdependence and international dimensions of sustainable development.
3. To emphasize the ethical obligation of the present generation to overcome those practices of

resource utilization and those widespread circumstances of intolerable human disparity which lie at the root of environmental unsustainability.

4. To maximize the capacity of the university to teach and undertake research in sustainable development principles, to increase environmental literacy, and to enhance the understanding of environmental ethics within the university and with the public at large.
5. To co-operate with one another and with all segments of society in the pursuit of practical and policy measures to achieve sustainable development and thereby safeguard the interests of future generations.
6. To encourage universities to review their own operations to reflect best sustainable development practices.
7. To request the ACU Council urgently to consider and implement the ways and means to give life to this declaration in the mission of each of its members and through the common enterprise of the ACU.

Done at the University of Wales, Swansea, the 20th day of August 1993

* The declaration adopts, quite substantially, the language of the Halifax Declaration, which was written by Ivan Head and Walter Kamba in consultation with Halifax conference participants.

THE KYOTO DECLARATION - November 1993

Stellenbosch University <http://scholar.sun.ac.za>

1. To urge universities of the IAU to seek, establish and disseminate a clear and consistent commitment to sustainable development - development which meets the needs of the present without compromising the needs of future generations - and encourage more appropriate sustainable development principles and practices at the local, national and global levels, in ways consistent with their missions.
2. To utilize resources of the university to encourage a better understanding on the part of governments and the public at large of the inter-related physical, biological and social dangers facing the planet Earth, and to recognize the significant interdependence and international dimensions of sustainable development.
3. To emphasize the ethical obligation of the present generation to overcome those practices of resource utilization and those widespread disparities which lie at the root of environmental unsustainability.
4. To enhance the capacity of the university to teach and undertake research and action in society in sustainable development principles, to increase environmental literacy, and to enhance the understanding of environmental ethics within the university and with the public at large.
5. To co-operate with one another and with all segments of society in the pursuit of practical and policy measures to achieve sustainable development and thereby safeguard the interests of future generations.
6. To encourage universities to review their own operations to reflect best sustainable development practices.
7. To request the IAU Council urgently to consider and implement the ways and means to give life to this declaration in the mission of each of its members and through the common enterprise of the IAU.
8. This declaration embodies the language and substance of both the Halifax Declaration and the Swansea Declaration.

Geneva, May 1994

Preamble

Man's exploitation of the biosphere is now threatening its very existence and delicate balance. Over the last few decades, the pressures on the global environment have become self-evident, leading to a common outcry for sustainable development. In the words of the Brundtland report, we must learn to care for the needs of the present without compromising the ability of future generations everywhere to meet their own needs.

The awareness is there. What is required is a comprehensive strategy for building a sustainable future which is equitable for all human beings, as highlighted by the Rio Conference (UNCED) in 1992. This requires a new frame of mind and new sets of values.

Education is critical for promoting such values and improving people's capacity to address environment and development issues. Education at all levels, especially university education for the training of decision-makers and teachers, should be oriented towards sustainable development and foster environmentally aware attitudes, skills and behavior patterns, as well as a sense of ethical responsibility. Education must become environmental education in the fullest sense of the term.

The role of universities

Universities and equivalent institutions of higher education train the coming generations of citizens and have expertise in all fields of research, both in technology as well as in the natural, human and social sciences. It is consequently their duty to propagate environmental literacy and to promote the practice of environmental ethics in society, in accordance with the principles set out in the Magna Chart of European Universities and subsequent university declarations, and along the lines of the UNCED recommendations for environment and development education.

Indeed, universities are increasingly called upon to play a leading role in developing a multidisciplinary and ethically-oriented form of education in order to devise solutions for the problems linked to sustainable development. They must therefore commit themselves to an on-going process of informing, educating and mobilizing all the relevant parts of society concerning the consequences of ecological degradation, including its impact on global development and the conditions needed to ensure a sustainable and just world.

To achieve these aims and fulfill their basic mission, universities are urged to make every effort to subscribe to and implement the ten principles of actions set out below.

Principles of action

- Institutional commitment

Universities shall demonstrate real commitment to the principle and practice of environmental protection and sustainable development within the academic milieu.

- Environmental ethics

Universities shall promote among teaching staff, students and the public at large sustainable

consumption patterns and an ecological lifestyle, while fostering programmes to develop the capacities of the academic staff to teach environmental literacy.

- Education of university employees

Universities shall provide education, training and encouragement to their employees on environmental issues, so that they can pursue their work in an environmentally responsible manner.

- Programmes in environmental education

Universities shall incorporate an environmental perspective in all their work and set up environmental education programmes involving both teachers and researchers as well as students - all of whom should be exposed to the global challenges of environment and development, irrespective of their field of study.

- Interdisciplinarity

Universities shall encourage interdisciplinary and collaborative education and research programmes related to sustainable development as part of the institution's central mission. Universities shall also seek to overcome competitive instincts between disciplines and departments.

- Dissemination of knowledge

Universities shall support efforts to fill in the gaps in the present literature available for students, professionals, decision-makers and the general public by preparing information didactic material, organizing public lectures, and establishing training programmes. They should also be prepared to participate in environmental audits.

- Networking

Universities shall promote interdisciplinary networks of environmental experts at the local, national, regional and international levels, with the aim of collaborating on common environmental projects in both research and education. For this, the mobility of students and scholars should be encouraged.

- Partnerships

Universities shall take the initiative in forging partnerships with other concerned sectors of society, in order to design and implement coordinated approaches, strategies and action plans.

- Continuing education programmes

Universities shall devise environmental educational programmes on these issues for different target groups: e.g. business, governmental agencies, non-governmental organizations, the media.

- Technology transfer

Universities shall contribute to educational programmes designed to transfer educationally sound and innovative technologies and advanced management methods.

This document is a follow-up to a number of university initiatives concerned with environmental awareness and responsibility, recent examples of which include:

- o the Magna Charta of European Universities, Bologna, September 1988
- o University Presidents for a Sustainable Future, the Talloires Declaration, October 1990
- o Urgent Appeal from the CRE, the association of European universities, presented to the Preparatory Committee for the United Nations Conference on Environment and Development (UNCED), Geneva, August 1991
- o Creating a Common Future: An Action Plan for Universities, Halifax, December 1991

Principles of action

- o Institutional commitment
- o Environmental ethics
- o Education of university employees
- o Programmes in environmental education
- o Interdisciplinarity
- o Dissemination of knowledge
- o Networking
- o Partnerships
- o Continuing education programmes
- o Technology transfer

Endorsing the Charter

The CRE Bureau invites university rectors to endorse the Charter on behalf of their institutions. Their signature will constitute a commitment to secure the support of their university, teachers and students alike, in adopting and implementing environmental guidelines which are consistent with the Charter.

The principles of action listed above are general and open-ended. It is left to each individual institution and its students and staff to give them substance compatible with local circumstances. Expressed in terms of specific guidelines, they should form a key element in the mission statement of the university concerned.

CRE

The Conference of European Rectors (CRE) is the association of European universities. Its membership comprises 500 universities or equivalent institutions of higher education in 36 countries. It provides a forum for discussions on academic policy and the institutional development of universities, including their role within European society.

As a non-governmental organization, it represents the universities' point of view in governmental and non-governmental circles concerned with higher education in Europe. CRE organizes bi-annual conferences, training seminars for newly appointed university heads, and other meetings on issues of interest to its members. It also runs a number of inter-university cooperation programmes.

Copernicus

COPERNICUS (CO-operation Programme in Europe for Research on Nature and Industry through Coordinated University Studies) is a programme of CRE designed to bring together universities and other concerned sectors of society from all parts of Europe to promote a better understanding of the interaction between man and the environment and to collaborate on

common environmental issues. The aims of the programme are:

- o to incorporate an environmental perspective into all university education and to help develop teaching materials as necessary;
- o to stimulate and coordinate integrated, multidisciplinary and collaborative research projects;
- o to disseminate the research and empirical findings widely to economic and political decision-makers.

Priority areas for the time being are comparative environmental law, resource economics, and public health. To encourage the bridging of former divisions between eastern and western Europe, COPERNICUS has set up trans-national projects involving institutions from the Baltic and Danube regions. Future plans involve launching environmental networks in other regions of Europe.

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Association of University Leaders for a Sustainable Future
MEMBERSHIP FORM
(please type or print)

Stellenbosch University <http://scholar.sun.ac.za>

Name _____
 Title _____
 Institution _____
 Mailing Address _____
 City _____ State/Province _____ Postal Code _____
 Country _____ Email _____
 Phone _____ Fax _____
 Website URL _____

CATEGORIES *(please check appropriate one)*: Check enclosed Send Invoice

<input type="checkbox"/> Higher Education Institution*			
<i>High Income Country*</i>		<i>Low/Middle Income Country*</i>	
<input type="checkbox"/> Private Institution	\$500	<input type="checkbox"/> All Institutions	\$250
<input type="checkbox"/> Public Institution	\$375		
<input type="checkbox"/> University Department* or Affiliated Research Center			
<i>High Income Country</i>		<i>Low/Middle Income Country</i>	
<input type="checkbox"/> Private Institution	\$250	<input type="checkbox"/> All Institutions	\$125
<input type="checkbox"/> Public Institution	\$175		
<input type="checkbox"/> Student Group/Individual	\$45		
<input type="checkbox"/> Affiliate <i>(Corporation, Government Agency, Non-Profit Organization, etc.)</i>			
<input type="checkbox"/> High Income Country	\$500	<input type="checkbox"/> Low/Middle Income Country	\$250

*For member institutions and departments, the electronic subscription to the "International Journal of Sustainability in Higher Education" is sent to your library for general access. Please provide the following contact information for the librarian to whom this journal should be sent.

Name _____ Email _____
 Address _____
 City _____ State/Province _____ Zip _____
 Phone _____ Fax _____

* This classification of countries according to high income (GNP per capita above \$9,386 in 1995), middle income (GNP per capita \$766 to \$9,385 in 1995), and low income (GNP per capita \$765 or below in 1995) derives from and is maintained by the United Nations. As an international membership organization with an interest in working with institutions from middle and low income countries, ULSF tries to accommodate financial realities with its varied fee structure.

Please answer the following questions *(add additional sheets if necessary)*.

1) Does your institution have an environmental policy? Yes *(please enclose a copy)* No

2) What environmental/sustainable development academic courses or programs does your institution offer (degree and non-degree)? Please be as concise as possible; this information will be used to promote your institution in our resource and member database.

3) What environmental/sustainable development research is your institution currently engaged in?

4) What environmental operations systems or programs (such as recycling) are in place at your institution?

5) What outreach efforts (partnerships) are in place at your institution that address sustainability in your community and the world?

6) Please add any other comments concerning sustainability efforts at your institution.

MEMBER CONTACT LIST

Stellenbosch University <http://scholar.sun.ac.za>

Please list the contacts (including yourself) who will be key organizers of your environmental and sustainable development programs and projects. Contacts will receive ULSF publications, the monthly e-bulletin, etc.

- Higher Education Institutions → 10 contacts
- Departments/Affiliated Research Centers → 5 contacts
- Student Groups → 2 contacts

Main Contact (ULSF's main point of contact for membership renewal, questions, etc.)

1. (circle one): Mr. Ms. Mrs. Dr. Other _____ Faculty Administration Student

Name _____
 Title _____
 Mailing Address _____
 City _____ State/Province _____ Postal Code _____
 Country _____ Email _____
 Phone _____ Fax _____

2. (circle one): Mr. Ms. Mrs. Dr. Other _____ Faculty Administration Student

Name _____
 Title _____
 Mailing Address _____
 City _____ State/Province _____ Postal Code _____
 Country _____ Email _____
 Phone _____ Fax _____

3. (circle one): Mr. Ms. Mrs. Dr. Other _____ Faculty Administration Student

Name _____
 Title _____
 Mailing Address _____
 City _____ State/Province _____ Postal Code _____
 Country _____ Email _____
 Phone _____ Fax _____

4. (circle one): Mr. Ms. Mrs. Dr. Other _____ Faculty Administration Student

Name _____
 Title _____
 Mailing Address _____
 City _____ State/Province _____ Postal Code _____
 Country _____ Email _____
 Phone _____ Fax _____

5. (circle one): Mr. Ms. Mrs. Dr. Other _____ Faculty Administration Student

Name _____
 Title _____
 Mailing Address _____
 City _____ State/Province _____ Postal Code _____
 Country _____ Email _____
 Phone _____ Fax _____

6. (circle one): Mr. Ms. Mrs. Dr. Other _____ Faculty Administration Student

Name _____
 Title _____
 Mailing Address _____
 City _____ State/Province _____ Postal Code _____
 Country _____ Email _____
 Phone _____ Fax _____

7. (circle one): Mr. Ms. Mrs. Dr. Other _____ Faculty Administration Student

Name _____
 Title _____
 Mailing Address _____
 City _____ State/Province _____ Postal Code _____
 Country _____ Email _____
 Phone _____ Fax _____

8. (circle one): Mr. Ms. Mrs. Dr. Other _____ Faculty Administration Student

Name _____
 Title _____
 Mailing Address _____
 City _____ State/Province _____ Postal Code _____
 Country _____ Email _____
 Phone _____ Fax _____

9. (circle one): Mr. Ms. Mrs. Dr. Other _____ Faculty Administration Student

Name _____
 Title _____
 Mailing Address _____
 City _____ State/Province _____ Postal Code _____
 Country _____ Email _____
 Phone _____ Fax _____

10. (circle one): Mr. Ms. Mrs. Dr. Other _____ Faculty Administration Student

Name _____
 Title _____
 Mailing Address _____
 City _____ State/Province _____ Postal Code _____
 Country _____ Email _____
 Phone _____ Fax _____

Please return this completed form (along with your check) to:

ULSF
 2100 L Street, NW
 Washington, DC, 20037
 USA

Tel: 202.778.6133
 Fax: 202.778.6138



Association of
UNIVERSITY LEADERS
FOR A
SUSTAINABLE FUTURE

Dear Colleague,

We are pleased to provide you with the enclosed Sustainability Assessment Questionnaire (SAQ), a simple instrument designed to help colleges and universities assess the extent to which they are sustainable in their teaching and practice. The Association of University Leaders for a Sustainable Future (ULSF) has developed the SAQ in consultation with leaders in the field and through pilot tests at various institutions.

In constructing the questionnaire, we envisioned both a teaching tool and an assessment instrument. That is, by its very design and content we wanted the SAQ to offer its users a comprehensive definition of sustainability in higher education as well as to provide a snapshot of their institution on the path to sustainability.

We would like your suggestions on how the questionnaire might be improved. We appreciate your interest in using this instrument and we hope that it serves to further your institution's commitment to a sustainable future.

Sincerely,

The ULSF Staff

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ULSF

Association Of
UNIVERSITY LEADERS
FOR A
SUSTAINABLE FUTURE

Sustainability Assessment Questionnaire (SAQ)
for Colleges and Universities
October 1999 Draft
Standard Form

This SAQ is designed to assist you in assessing the extent to which your college or university is sustainable in its teaching, research, operations and outreach. "Sustainability" implies that the major activities on your campus are ecologically sound, socially just, economically viable and humane, and that they will continue to be so for future generations. Academic institutions vary considerably in how they approach sustainability: some concentrate on minimizing their ecological impact through changes in operations; others emphasize sustainability in the curriculum.

This survey of sustainability at your college or university asks you to give impressions of your institution's accomplishments on seven critical dimensions of higher education: 1. Curriculum; 2. Scholarly Activities; 3. Institutional Operations; 4. Faculty and Staff Development and Rewards; 5. Outreach and Service; 6. Student Opportunities; 7. Institutional Mission and Structure. The SAQ is designed to stimulate discussion and further assessment by campus representatives who are knowledgeable about and responsible for the activities mentioned in each section. It is intended to be part of a group exercise, ideally facilitated by a ULSF staff member.

If you wish to guide the process yourself, we suggest the following: 1. Assemble 10-15 representatives from critical campus constituencies, including students, faculty, staff, and administration; 2. Review the purpose and objectives of the exercise, the nature of sustainability in higher education, etc.; 3. Take about 30 minutes for each person to fill

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out the questionnaire individually; 4. Facilitate a discussion in which the group reviews the questionnaire section by section and gathers impressions; 5. Brainstorm possible next steps to strengthening sustainability on your campus. Note: The exercise could take 2-3 hours or more, and may be best carried out over two or three sessions.

Directions: Please read through the definitions of sustainability (p.3) and all the questions prior to completing the questionnaire. This will give you a sense of how we understand "sustainability." Then answer each question to the best of your ability. Remember that this questionnaire is seeking your impressions on each dimension, so you need not have detailed information on all courses offered, transportation and recycling programs, etc., in order to complete it. If you lack enough information for a reliable impression, please indicate that you don't know the answer to that question.

It is important to recognize that all institutions will "score low." Very few, if any, institutions embody sustainability on all these dimensions. Sustainability is not a major focus of the academic disciplines or the wider economy in which higher education functions. Thus it is difficult for any college or university to be very advanced in implementing sustainability.

We would prefer that the person(s) initiating this exercise be in contact with a ULSF staff member prior to their first meeting. Also, we would like those who use the SAQ independent of ULSF consultants to let us know how participants responded by returning a copy of the SAQ with summarized responses and reporting briefly on reactions to and outcomes of the exercise. This is critical for our ongoing research and assessment work. Note: Since the questions are primarily qualitative and impressionistic, we cannot use the responses to rate or compare institutions.

Thank you.

Definitions of sustainability:

- Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

- Brundtland Commission, 1987

- Historically, the term "sustainable" arose among those with environmental concerns, and most of the literature and assessment instruments reflect this emphasis. However, it is increasingly recognized that sustainability cannot be achieved without addressing social justice issues. There can be no sustainable communities and institutions without social justice. So too is humane consideration toward the whole community of life an essential part of true sustainability. An academic institution committed to sustainability should help students understand the roots of today's injustices and motivate them to seek justice and humaneness in full integration with understanding the roots of environmental degradation and modeling environmentally sustainable practices.

- John B. Cobb Jr., "Sustainability and the Liberal Arts" conference, 1998

- Sustainability is an ideal end-state. Like democracy, it is a lofty goal whose perfect realization eludes us. For this reason, there will always be competing definitions of sustainability. We know these definitions will always include the well-being of people, nature, our economy, and our social institutions, working together effectively over the long term. But as the process of attempting to achieve sustainability will continuously reveal new challenges and questions -- pushing back the horizon, as it were -- a definitive definition is an impossibility. Any indicator framework, therefore, needs to be flexible and adaptable to these changing definitions. It needs to grow as our understanding grows, while continuing to serve its purpose as a simplifier and guide to complexity. It needs to maintain a trail of continuity from year to year and decade to decade. Most important, it needs to speak to people in ways understandable both to the rational mind, and to the intuition.

- Alan AtKisson, "The Compass of Sustainability: Framework for a Comprehensive Information System," 1998

Date: _____

Name: _____ Position: _____

Institution: _____

Curriculum

1. Indicate the extent to which your institution offers courses which address topics related to sustainability. (Such topics could include globalization and sustainable development; environmental policy and management; environmental philosophy; nature writing; land ethics and sustainable agriculture; urban ecology and social justice; population, women and development; sustainable production and consumption; and many others.) [Please circle the appropriate number on this and the following questions]:

1 (none) 2 (a little) 3 (quite a bit) 4 (a great deal) 5 (don't know)

Please list any courses you are aware of in which such topics are taught: _____

2. What courses do you regard as essential that are not being taught?

3. Indicate the extent to which sustainability is a focus woven into traditional disciplinary education in science, math, literature, history, the arts, etc.?

1 (none) 2 (a little) 3 (quite a bit) 4 (a great deal) 5 (don't know)

Please comment on how this is done: _____

4. The shift to sustainability requires critical thinking about the role of the institution in its social and ecological systems. Circle which of the following your institution attempts to instill in its students:

a - how the campus functions in the ecosystem (e.g. its sources of food, water, energy, as well as the endpoint of waste and garbage)

b - a sense of place: the natural features, biota, history and culture of the region

- c - the institution's contribution to a sustainable economy and sustainable local communities
- d - how the institution views and treats its employees (such as staff and faculty involvement in decision-making, their status and benefits, etc.)
- e - the basic values and core assumptions that shape the content and methods of the academic disciplines

Comments: _____

Scholarly Activities

5. Estimate the amount of research or scholarship being done in the various disciplines in the area of sustainability (for example, renewable energy, sustainable building design, ecological economics, indigenous wisdom and technologies, population and development, total environmental quality management, etc.).

1 (none) 2 (a little) 3 (quite a bit) 4 (a great deal) 5 (don't know)

Please list any research and scholarly activities you are aware of related to sustainability:

6. a) What percentage of faculty members teach or do research on sustainability issues?

_____ %

b) What percentage of faculty members do you estimate would be interested in teaching and research on sustainability issues?

_____ %

7. Does your institution have established multidisciplinary and interdisciplinary structures for research, education and policy development on sustainability issues?

_____ Yes _____ No If yes, please describe: _____

Stellenbosch University <http://scholar.sun.ac.za>Institutional Operations

8. The chart below lists some of the operational practices emphasized by institutions moving toward sustainability. Please complete the chart and indicate the extent to which your institution has implemented these practices using the following scale: 1 - none; 2 - a little; 3 - quite a bit; 4 - a great deal; 5 - don't know.

<u>PRACTICES</u>	Rate from 1 – 5	Please comment
CO ₂ and air pollution reduction practices (including alternative fuel use, renewable energy sources, emission control devices, etc.)		
Indoor air quality standards and practices		
Building construction and renovation based on ecological design principles		
Energy conservation practices (in offices, laboratories, libraries, classrooms and dormitories)		
Local or organic food purchasing program		
Purchasing from and investing in environmentally and socially responsible companies		
Waste reduction practices		
Recycling of solid waste (including paper, plastic, metal, etc.)		
Transportation program (including bicycle/pedestrian friendly systems, car pools, bus pass programs, electric/natural gas campus vehicles, etc.)		
Water conservation practices (including efficient shower heads and irrigation systems)		
Integrated Pest Management practices		
Source reduction of toxic materials and radioactive waste		
Sustainable landscaping (emphasizing native plants, biodiversity, minimizing lawn, etc.)		
Others (please specify):		

9. What do you see when you walk around campus that tells you this is an institution committed to sustainability?

10. To what extent are your operations practices integrated into the educational and scholarly activities of the school?

1 (none) 2 (a little) 3 (quite a bit) 4 (a great deal) 5 (don't know)

Please provide examples of this integration: _____

Faculty and Staff Development and Rewards

11. To what extent do criteria for hiring, tenure and promotion recognize faculty member contributions to sustainability (in scholarship, teaching, or campus and community activities)?

1 (none) 2 (a little) 3 (quite a bit) 4 (a great deal) 5 (don't know)

Describe how such considerations are weighed in these decisions: _____

12. To what extent does your college or university provide significant faculty and staff development opportunities to enhance understanding, teaching and research in sustainability?

1 (none) 2 (a little) 3 (quite a bit) 4 (a great deal) 5 (don't know)

Please describe recent faculty or staff development opportunities in these areas: _____

Outreach and Service

13. A sustainable institution supports sustainable communities in the surrounding region through partnerships with primary and secondary schools and relationships with local governments and businesses. It also seeks international cooperation in solving global environmental justice and sustainability problems through conferences, student/faculty exchanges, etc. To what extent is your institution involved in sustainable community work or partnerships at local, regional, national or international levels.

- 1 (none) 2 (a little) 3 (quite a bit) 4 (a great deal) 5 (don't know)

Please describe: _____

14. What sustainability related community service, service learning and/or internship programs exist at your institution?

Student Opportunities

15. Institutions committed to sustainability provide students with particular opportunities and settings. Please check which of the following are present on your campus:

_____ Student Environmental Center

_____ Ecology House or Sustainable Dormitory

_____ Orientation programs on sustainability for students

_____ Other: _____

16. How does your college or university encourage students to consider sustainability issues when choosing a career path? [Please check (✓) below where applicable]

_____ job fairs and career counseling focused on work in sustainable enterprises

_____ pledge of social and environmental responsibility

_____ other: _____

17. To what extent are student groups across campus directly involved in sustainability initiatives?

- 1 (none) 2 (a little) 3 (quite a bit) 4 (a great deal) 5 (don't know)

Describe which groups are most involved and how: _____

Institutional Mission and Structure

18. To what extent do the formal written statements describing the purposes and objectives of the units listed below reflect a commitment to sustainability? (Such statements include policy and planning documents, annual reports, brochures, catalogues, etc.) [Please rate using the following scale: 1 – none; 2 - a little; 3 - quite a bit; 4 - a great deal; 5 - don't know]

_____ the institution as a whole

_____ your college or division

_____ your unit/department

_____ other units within the institution (please define: _____)

Comments: _____

19. Institutions committed to sustainability create certain positions and committees, as well as engage in certain practices which reinforce this commitment. Please check (✓) which of the following are present on your campus:

- _____ Environmental Council or Task Force
- _____ Environmental Coordinator- ()student or ()staff member
- _____ Dean of Environmental Programs or Director of Sustainability Programs (a high level officer responsible for these activities)
- _____ Energy Officer
- _____ Green Purchasing Coordinator
- _____ Institutional Declaration of Commitment to Sustainability/Environmental Responsibility
- _____ Orientation programs on sustainability for faculty and staff
- _____ Socially responsible investment practices and policies
- _____ Regularly conducted environmental audits
- _____ Other: _____

20. How is a concern for, and commitment to, sustainability given broad visibility on your campus (for example, with guest speakers, conferences, Earth Day celebrations, etc.)? Please describe key events that have happened in the past year:

21. Please describe the greatest strengths and weaknesses of your institution in educating for sustainability.

22. a) What "next steps" are planned at your college or university to strengthen your commitment to sustainability?

b) What "next steps" would you like to see planned?

Please add any additional comments below:

1. Die Universiteit van Stellenbosch aanvaar dit as een van sy doelstellings om sy personeellede, studente, bates en bronne teen enige vorm van fisiese risiko te beskerm. In die strewe om hierdie breë doelstelling te verwesenlik, volg hy erkende risikobestuurspraktyke om verliese te voorkom en verminder om sodoende gepaardgaande kostes tot 'n minimum te beperk.
2. Dit is 'n spesifieke doelstelling van die Universiteit om alles in sy vermoë te doen om sy personeellede, studente en besoekers sover prakties moontlik teen beroepsgeondheids- en veiligheidsrisiko's te beskerm.
3. Die Universiteit verbind hom ook daartoe om alle statutêre en ander wettlike verpligtinge, en in die besonder dié wat deur die Wet op Beroepsgeondheid en Veiligheid (Wet 85 van 1993) opgelê word, noudeset na te kom. Die Universiteit verlang derhalwe dat al sy personeellede en studente die verbandhoudende verpligtinge wat deur bogenoemde en ander wette op hulle geplaas word, moet nakom.
4. Die Universiteit verlang dat al sy personeellede en studente sy risikobestuursbeleid in alle opsigte moet aanvaar en nakom. Die Universiteit hou alle personeellede wat met bestuurspligte en/of toesighouding belas is, kragtens artikel 16(2) van die bogenoemde Wet, mede-verantwoordelik en -aanspreeklik vir die nodige stappe om alle fisiese risiko's maar veral dié ten opsigte van beroepsgeondheid en veiligheid te identifiseer, evalueer en kragtens die bepalinge van wetgewing en standaard werksprosedures van die Universiteit te hanteer en bestuur.
5. Doelgerigte risikofinansieringsmetodes insluitende koste effektiewe verskering en die voorsiening van fondse vir risikovoorkoming bly 'n hoë prioriteit maar is onderworpe aan praktiese en ekonomiese beperkinge.
6. Die Hoof: Risikobestuur het tot taak om in aansluiting by bogenoemde risikobestuurspraktyke, prosedures en stelsels te ontwikkel en te help ontwikkel met behulp waarvan die Universiteit sy bogenoemde beleid so effektief moontlik kan toepas. By die uitvoering van hierdie taak tree die Hoof: Risikobestuur dus bowenal in 'n raadgewende, fasiliterende en koördinerende hoedanigheid op. Hy doen in dié verband regstreeks aan die Sentrale Bestuur van die Universiteit verslag.



Prof H CHRISTO VILJOEN
Viserektor (Bedryf)

20 Maart 1998