Solid Waste Management: Developing a Waste Minimisation Programme for the University of Cape Town

Picture from Cheltenden Nicks deVilliers, 2002

Submitted in partial fulfilment of the requirements
of the MPhil in Environmental Management
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Executive Summary

Background and Approach

A team of 2nd Year MPhil (Environmental Management) students from the Department of Environmental and Geographical Science were commissioned by Properties & Services (P&S) to undertake a waste management review, with the purpose of developing a waste minimisation programme for UCT and investigating on-site and/or off-site options for a Materials Recovery Facility (MRF) for UCT. This review was to complement a parallel study toward an Environmental Management System (EMS) at UCT.

The waste management review focuses only on solid waste, excluding all toxic, chemical, hazardous and medical waste, generated by the university institutions and activities in the Mowbray to Rondebosch sections of the UCT campus. That is, upper, middle and lower campuses, including the residences and the Baxter Theatre.

This study involved a survey, site observations and interviews with key stakeholders, to determine and evaluate the current solid waste management practices within the study area. Research was conducted on waste minimisation, namely on the philosophy and principles, and its application at other, mostly overseas, universities. South African laws and policies applicable to waste management and disposal were reviewed in order to establish the context for a waste minimisation programme at UCT.

Key Findings

The key findings of the review are as follows:

Legal and Policy Context

- A paradigm shift is occurring in South African law with respect to waste management. A shift from a philosophy dealing with waste only after it is generated towards pollution prevention, waste minimization, cross-media integration, and the involvement of all sectors of society in pollution and waste management.
- Based on current and emerging legal principles: UCT should strive to avoid waste or, where it cannot be altogether avoided, must minimise and re-use or recycle where possible and otherwise dispose of the waste in a responsible manner; UCT is responsible for the environmental health and safety consequences of a waste management policy, programme, project, product, process, service or activity throughout its entire life cycle; and UCT will be accountable for the management and disposal of its waste and will be penalised appropriately for any transgression.

Institutional Responsibility

- UCT is one of only five South African universities that is a signatory to the Talloires Declaration, with its related aims and objectives for sustainable campuses.
- The responsibility and cost of waste management at UCT is currently borne by P&S, which operates at a university-wide, centralised level, and is responsible for the entire UCT campus. However, the generation of most of UCT's solid waste is associated with departmental, residence and canteen activities.

Cost of Waste Disposal

- Disposal costs at landfill sites in South Africa have increased by 700% since 1991, while in Cape Town disposal costs increased by 88% in 1999, and are expected to continue to increase sharply as landfill space diminishes: Four out of the six landfill sites that serve Cape Town will close down within the next four years.
- Given the increasing costs of disposal to landfill, UCT should benefit from a waste minimization programme, because significantly less waste will be sent to landfill through the reduction, reuse and recovery of solid waste from the general waste stream. UCT, however, presently pays about R1 million per annum to the City Council whether or not it disposes of its waste at a municipal landfill

site. There is thus little financial incentive, at this level, for UCT to minimize solid waste as it would not benefit from a reduced charge.

Waste Management Practices at UCT

- Paper and food waste are the largest categories of solid waste at UCT.
- UCT presently reuses its furniture, office equipment and computers wherever possible. In addition, UCT currently keeps most garden waste and mulches it for use on campus gardens.
- UCT, through Don't Waste Services (DWS), removes recyclable materials from its solid waste stream. UCT currently has a contract with DWS to collect and sort all solid waste. This costs UCT R38,000 per month as a service fee, but UCT recoups at least R5000 per month from the sale of the recovered recyclable materials.
- Past waste management initiatives at UCT failed because of: inadequate financial assessment of the projects which turned out to be too costly for UCT; absence of a waste policy and appropriate institutional structures to manage the implementation process; and insufficient student awareness and participation.
- It is not possible for UCT to ascertain its inputs, because purchases are frequently incorrectly entered into the SAP computer system, resulting in as much as 40% margin of error.
- The DWS statistics of UCT's solid waste stream are not updated regularly, and are unreliable because of unexplained anomalies within their datasets.
- Current waste management practice provides little opportunity for raising the environmental awareness of staff and students. All bins on campus are for general waste, so no separation of waste is required. In the Food Court and Nescafe Coffee Shop waste is simply left on tables by students for a cleaner to clear away. Thus students gain no sense of responsibility for their waste.
- Almost half of the departments interviewed recycle paper, either through departmental initiatives or personally by cleaners. This accounts for the significant reduction in paper collected by UCT as opposed to Natal University. Ironically, DWS has asked P&S to intervene as their profits are adversely affected by this recycling.
- Many departments are storing broken computers and other machinery and electronic equipment as they are unsure how to dispose of them. Information and Communication Technology Services (ICTS) has a policy for dealing with out-of-date computers, but departments seem unaware of it.
- There is little incentive for departments to update their computers regularly as the cost of servicing and repairing old machines is borne by ICTS, whereas replacement costs are borne by departments. Thus computers are often unsaleable when they become unusable at UCT, and so add to the waste burden. ICTS would like departments to buy into a 5-year replacement cycle for computers.
- It is premature to plan to build an MRF on UCT property because of insufficient reliable quantitative information on which to base the decision. A waste audit needs to be undertaken to determine the type, quality and quantity of waste produced by UCT, and the extent to which a waste minimisation programme through reduction and reuse will undermine the economies of scale of an on-site MRF.

Best Practice Waste Minimisation and its Application at UCT

- Waste minimisation aims to reduce the amount of waste sent to landfill sites. Best practice is to tackle causes and sources of waste, in order to reduce the quantity of waste generated at source. For waste which is unpreventable, recovery through recycling and composting is preferable to disposal.
- A waste minimization programme at UCT must recognise that the problems of a research and educational institution are different from that of industries. Management structures of universities do not lend themselves to the more centralized decision-making found in industries. While decentralization facilitates academic independence, a decentralized approach poses obstacles to the complete tracking of the inputs and outputs of the system.
- Departmental autonomy could be either an opportunity or a constraint at UCT, depending on how the autonomy is managed. A waste management programme is easier to implement and monitor in a smaller area, so departments are better able to make real changes than a large organisation the size of UCT.

Key Recommendations

There are three key recommendations arising from the review, which relate to UCT policy, a waste audit, and the establishment of a waste minimsation club. A number of other recommendations are made with regard to institutional arrangements, raising awareness of waste minimization, and implementing specific measures at UCT to minimise waste.

1. UCT Policy

Waste minimization initiatives are likely to fail if they are initiated in a policy vacuum. It is thus essential that the *UCT Draft Environmental Policy* is accepted and informs the development of all other related policies, including a *Waste Minimisation Policy* and *Purchasing Policy*.

UCT currently has a *Waste Management Plan* at draft however this has limitations and should rather be reformulated into a Waste Minimisation Policy, based on this study.

The policy to promote waste minimization, and the necessary structures to support it must be agreed to and supported at the highest level of the university, since this will give credence to the initiatives that follow and increase the likelihood of its sustainability. Thus a waste minimisation programme at UCT must incorporate the entire organisational hierarchy of the campus, starting with upper administration down to the student level.

2. Waste Audit

A sound waste minimisation programme relies on reliable information on the waste stream. Given shortcomings in information on UCT's waste, a university-wide waste audit should be conducted as a matter of urgency. A number of possible actions, such as the siting of an MRF on or off campus, are dependent on the outcomes of an audit.

The waste audit must identify and quantify the waste streams generated at UCT and the areas they are coming from. The waste audit would be useful in setting up a Waste Minimisation Club and providing incentives for departments to minimise waste. There is a logical link here with the development of an EMS at UCT which will also require audits of other waste streams.

3. Waste Minimization Club(s)

One or several Waste Minimisation Clubs should be started at UCT since this provides a forum to integrate the operations of centralised P&S, administration and autonomous departments. Also, such Clubs would enable the formulation of financial incentives to minimise waste.

The waste minimisation club should involve key personnel from each department, who then would effectively form the team to drive the waste minimisation programme at UCT.

Waste Minimisation Clubs could be run by Institute for Sustainable Business (BECO), the organisation running most of the Cape Town waste minimisation clubs, or a new staff member could be appointed to co-ordinate the clubs. If the former is agreed to, then P&S could enter into dialogue with BECO about implementing a Waste Minimisation Club and work towards its implementation at UCT. This would have to be taken to the Environmental Management Working Group (EMWG) and from there, to the broader university community for acceptance.

List of Acronyms

BECO	Institute for Sustainable Business
CCT	City of Cape Town
DVC	Deputy Vice Chancellor
DWS	Don't Waste Services
E&T	White Paper on Education and Training
EC	Estates and Custodial
ECA	Environmental Conservation Act
EEU	Environmental Evaluation Unit,
EIA	Environmental Impact Assessment
EMP	Environmental Management Policy
EMS	Environmental Management System
EMWG	Environmental Management Working Group
GPC	General Purpose Committee
ICTS	Information and Communication Technology Services
IP&WM	Integrated Pollution and Waste Management
MPhil	Master of Philosophy
MRF	Materials Recovery Facility
NEMA	National Environmental Management Act
NWMS&AP	National Waste Management Strategy and Action Plans
OAR	Organization for Applied Research
P&S	Properties and Services
PASE	Partnership for a Sustainable Environment
SRC	Student Representative Council
ToR	Terms of Reference
UCT	University of Cape Town
ULSF	Association of University Leaders for a Sustainable Future
UB&DC	University Building and Development Committee.
UPE	University of Port Elizabeth

Note on layout and referencing system:

In the interests of waste minimisation, single line spacing has been used instead of the 1½ line spacing traditionally employed. For the same reasons, an end note referencing system has been applied. Numbers in the text relate to references at the end of each section.

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1. Introduction

The need for a waste management review, with the purpose of developing a waste minimization programme for the University of Cape Town (UCT), was identified at a meeting of the UCT Environmental Management Working Group (EMWG) in February 2003. Arising from this meeting, a group of four MPhil students were appointed by UCT Properties and Services (P&S) to undertake the study.

1.1 Background to Study

Various solid waste management strategies have been tried at UCT over the past two decades. (See Appendix C2 for an overview of past initiatives.) In the 1980's UCT initiated an anti-litter campaign on campus. Litter was even not collected for almost a month to raise the awareness of litter on campus. Bins were placed around campus, but mainly in front of the Jameson building, for the separation of glass and paper. In the early 1990's, UCT became the first university in South Africa to institute a comprehensive recycling programme and even produced Reviva', the first locally recycled paper in South Africa. Unfortunately all of the formal UCT driven initiatives eventually failed. Consequently the predominant management of solid waste at UCT has been through disposal at landfills, with *ad hoc* recycling occurring in some departments.

Importantly, in 1990 Vice-Chancellor Sanders of UCT, one of the creators and first signatories to the Talloires Declaration, committed UCT to *inter alia*:[1]

> *1) Increase Awareness of Environmentally Sustainable Development*
> Use every opportunity to raise public, government, industry, foundation, and university awareness by openly addressing the urgent need to move toward an environmentally sustainable future.
> *2) Create an Institutional Culture of Sustainability*
> Encourage all universities to engage in education, research, policy formation, and information exchange on population, environment, and development to move toward global sustainability.
> *3) Educate for Environmentally Responsible Citizenship*
> 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 have the awareness and understanding to be ecologically responsible citizens.
> *5) Practice Institutional Ecology*
> Set an example of environmental responsibility by establishing institutional ecology policies and practices of resource conservation, recycling, waste reduction, and environmentally sound operations.
> *7) Collaborate for Interdisciplinary Approaches*
> Convene university faculty and administrators with environmental practitioners to develop interdisciplinary approaches to curricula, research initiatives, operations, and outreach activities that support an environmentally sustainable future.
> *10) Maintain the Movement*
> Establish a Secretariat and a steering committee to continue this momentum, and to inform and support each other's efforts in carrying out this declaration.

UCT has, however, done very little to support the declaration's aims and objectives in the decade after its signing.[2]

This situation has recently begun to change. The EMWG was formed in 2001 under the auspices of the University Building and Development Committee (UB&DC) to drive sustainable practices on campus. In 2002, Vice-Chancellor Ndebele recommitted UCT to the implementation of sustainable development. In May 2002, Mrs Campbell of P&S accepted responsibility as an interim Environmental Control Officer - a first for UCT.[3] The Partnership for a Sustainable Environment (PASE) was launched in August 2002. One of its objectives was to "establish UCT as a model of a university that can function in a sustainable manner."[4] And an Environmental Policy was developed, although this is yet to become official UCT policy.

In September 2002, Don't Waste Services (DWS) was contracted to collect and sort UCT's solid waste into recyclable components. This was initially done on UCT property, at a temporary experimental Materials Recovery Facility (MRF) at the back of the old Chinese School on Avenue Road in Mowbray.

However, the on-site MRF was closed in January 2003 and all waste is now being transported off-site to a DWS MRF in the Airport Industria Complex.

P&S proposed building an MRF on a site above the Educare Centre on upper campus (where garden waste is currently being mulched).[5] It is envisaged that such a facility would provide learning and research opportunities as well as advance the sustainable practices of UCT.[6] Also towards the end of 2002, a draft *Waste Management Plan* was tabled at an EMWG meeting.[7]

In the meeting it was noted that:

> "There is a need to involve students with the management plan and that the sustainability of the activity needs to be safeguarded. A mechanism needs to be established to ensure that the waste-recycling program continues. ... we should target source reduction and that in doing so we should use the student body."[8]

Thus at the EMWG meeting in February 2003, it was agreed that a team of 2nd Year MPhil (Environmental Management) students from the Department of Environmental and Geographical Science would be commissioned by P&S to undertake:

- An initial review toward an Environmental Management System (EMS) at UCT.

  The initial review toward an EMS aims to identify the environmental impacts of UCT's operations and provide recommendations as to how the impacts can be mitigated, and the benefits can be enhanced. The basic aim of an EMS is continual improvement in environmental performance, which includes minimizing the consumption of resources (energy and materials) and the production of all forms of waste (energy, water, toxic, hazardous, medical, solid waste).

- A waste management review, with the purpose of developing a waste minimization programme for UCT.

  The Waste Minimization project focuses only, and in more detail than the EMS project, on the generation of solid waste at UCT. Waste minimization is a systematic approach to reducing the generation of waste at source, thereby reducing the amount of waste that is sent to landfill sites. The recommendations, while more specific than the EMS in the area of solid waste, will be dependent in the long term on the successful implementation of an EMS at UCT. Thus there is synergy between the EMS project and the Waste Minimization project.

1.2 Terms of Reference and Scope of Study

P&S appointed a group of four MPhil students to conduct a waste management review, with the purpose of developing a waste minimization programme for UCT[9].

The Waste Minimization project focuses on the solid waste generated by the university institutions and activities in the Mowbray to Rondebosch sections of the UCT campus, namely upper, middle and lower campuses, and includes the residences and the Baxter Theatre (See Appendix C1 for a Map of UCT).

P&S specified that for the purpose of this study, the interpretation of "*solid waste*" was to exclude all toxic, chemical, hazardous and medical waste, since UCT has a separate policy for hazardous and medical waste, and therefore manages it separately.

1.2.1 Aims

The aims of the project were to: [10]

- Evaluate the management of solid waste at UCT and see how the principles of waste minimization can be applied at UCT.
- Recommend an appropriate waste minimization strategy that takes into account cost, educational benefits and waste minimization best practice, within the framework of existing and emerging relevant South African laws and policies.
- Identify suitable sites for a MRF.

1.2.2 Objectives

The objectives of the project were to: [11]

- Survey, determine and evaluate the current solid waste management practices within the UCT study area.
- Investigate principles of waste minimisation and determine ways to apply these principles at UCT.
- Review the South African laws and policies applicable to waste management and disposal, in order to establish compliance with current legislation and policies and address the implications of any future legislation and policies.
- Evaluate solid waste management options for UCT that:
  - would be cost-effective,
  - would have educational benefits for staff and students, and
  - would be consistent with the best practice in waste minimization of both international and South Africa universities.
- Produce a report that incorporates the above components and recommends the most appropriate strategy for the management of solid waste at UCT.

1.3 Methodology and Approach to Study

In order to consider the various options for waste minimisation at UCT, the project was divided into the following phases:

- Phase 1: Literature review, information gathering. : March – May
- Phase 2: Site visits, workshop and specialist interviews. : April – May
- Phase 3: Production and review of Draft One report. : End of May
- Phase 4: Production and review of Draft Two report. : Mid – June
- Phase 5: Final Draft : Mid-June
- Phase 6: Final Report. : End of June

Each phase is discussed below:

Phase 1: Literature review, information gathering

A review of the existing information pertaining to waste minimisation in general, as well as specific solid waste management at UCT, was undertaken. The findings which form the knowledge base for this project were consolidated, and have been included as appendices, as follows:

- Appendix C1 Map of UCT
- Appendix C2 General Overview of Solid Waste Management at UCT
- Appendix C3 Information on Solid Waste Management, from interviews for the *Initial Review Toward an Environmental Management System at the University of Cape Town*,
- Appendix C4 Environmental Law: Definitions, Principles and Legislation Applicable to Solid Waste Management at UCT
- Appendix C5 Waste Minimisation Practice at Other Universities
- Appendix C6 Useful Document Prototypes

Phase 2: Site visits, workshop and interviews

In addition to the information gained from Phase 1, a number of site visits were conducted, a workshop was held and interviews were conducted, as discussed below:

Site Visits

- To different parts of UCT campus to observe the current management of solid waste;
- To the proposed MRF site as well as other potential MRF sites in the study area;

- To the DWS MRF at the Airport Industria Complex, to observe their practice.

Review Workshop

A workshop was held on 28 April 2003 with Tony Barbour and Lynette Kruger (Environmental Evaluation Unit, EEU), Susie Brownlie (deVilliers Brownlie Associates), Lillian Campbell (UCT Physical Planning Unit, P&S). The aim of the workshop was to review the information gathered, discuss matters arising, recommend areas of further study and chart a way forward for the project.

Interviews with Stakeholders and Specialists

Interviews were conducted with the following people:

UCT Stakeholders:

- Trevor Adams (Director of Procurement)
- Lillian Campbell (Physical Planning Unit, P&S)
- Alasdair Cunningham (Food Court Manager)
- Wayne Tzemis (Canteens Manager)
- Ann Chong (Residences Catering Manager)
- Fred Goldstein & Brian King (Information and Communication Technology Services)
- Duke Metcalf (Manager Estates & Custodial Services, P&S)
- Geoff de Wet (Head of Physical Planning Unit, P&S)
- Camilla Colley (Earthlife Africa, a key environmental NGO represented at UCT)

To avoid duplication, the project has also drawn on interviews with Heads of Departments undertaken as part of the EMS study described in Section 1.1 above.

Specialists:

- Susanne Dittke (City of Cape Town, Waste Management Department)
- Jeremy Droyman (Director of DWS)
- Peter Novella (City of Cape Town, Head of Waste Management)
- Zubeida Zwavel (BECO Institute for Sustainable Business)

Phases 3 - 5: Production and Review of Draft Reports

The information gathered in Phases 1 and 2 was synthesised and written up as a Draft One report and reviewed by Lynette Kruger and Susie Brownlie. Lynette Kruger and Susie Brownlie similarly reviewed the Draft Two report. The client, P&S as well as Lynette Kruger and Susie Brownlie, reviewed the Final Draft report.

Phase 6: Final Report

Submitted to external examiner and P&S.

1.4 Assumptions and Limitations

- *Assumption (i):* Information derived from secondary sources such as observations, key stakeholder interviews and reviews of waste minimization practices at other universities is reliable and therefore can be interpreted and generalized so as to inform the development of a waste minimization programme at UCT.
- *Limitation (i):* Inability to determine the quantities of inputs into the solid waste stream at UCT. Purchasing information was not available from the UCT Procurement Department despite repeated requests.
- *Limitation (ii):* Inability to determine the quantities of outputs from the solid waste stream at UCT. UCT's waste separation statistics were available on the DWS website. However, the DWS figures of quantities of recyclable materials recovered are not reliable. P&S has also asked that DWS provide a breakdown of the non-recyclable materials, "general waste", going to landfill but this is not yet

available. Consequently it has been impossible to determine reliably the composition of over two-thirds of UCT's waste, described as "general waste" by DWS.

- *Limitation (iii):* Departments could not provide accurate or reliable quantifiable data on either materials inputs or waste outputs. While *quantitative* data could not be gathered, *qualitative* data on the major types of solid waste was gathered from interviews with UCT stakeholders.
- *Limitation (iv):* Based on *Limitations* (i), (ii) and (iii) above specific waste minimization targets could not be derived and a realistic assessment of cost implications could not be achieved.
- *Limitation (v):* Similarly, based on *Limitations* (i), (ii) and (iii) above a valid solid waste stream baseline could not be established. Therefore an Environmental Impact Assessment (EIA) of the proposed and reasonable alternative MRF sites could not be conducted, as was initially asked by P&S, as the EIA in all likelihood would be flawed. For example, an Economic Feasibility Study is a key component of an EIA. Yet the economic feasibility of an MRF would depend on the quantities and types of recyclable materials being retrieved from the UCT waste stream, from which an income is derived, as well as the quantity and type of "general waste" going to landfill (disposal cost). However it is not possible to quantify UCT's solid waste at this stage, for the reasons given above.

1.5 Report Structure

- Section 1: Introduction
  Provides the background to the study, terms of reference and scope of study, methodology and approach to study as well as assumptions and limitations.
- Section 2: Waste Minimization Overview
  Provides an overview of the principles of waste minimization and the development of a waste minimisation programme.
- Section 3: Situational Analysis
  Describes the factors that should be considered in the development of a waste minimisation programme for UCT such National laws and policies, UCT policy, the Talloires Declaration, lessons learned from past attempts at waste management at UCT, current waste management practice at UCT and examples of waste minimisation at other universities.
- Section 4: Waste Minimisation at UCT
  Based on the steps of a waste minimisation programme, examines opportunities and constraints for waste minimisation at UCT with respect to the waste minimisation hierarchy of reduce, reuse and recover.
- Section 5: Scoping of Site Options for Material Recovery Facility at UCT
  Discusses the advantages and disadvantages of on-site and off-site MRFs. Scopes five possible locations for an on-site MRF at UCT.
- Section 6: Conclusions
- Section 7: Recommendations

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[1] See Appendix B4: Talloires Declaration, 1990
[2] Environmental Management Working Group (EMWG), *Minutes*, 11 May 2001
[3] EMWG, *Minutes*, 13 May 2002
[4] See Section 2, Situational Analysis: PASE
[5] Appendix B5: MRF Proposal, UCT Waste Separation Centre, Physical Planning Unit, Properties & Service
[6] EMWG, *Minutes*, 14 February 2002
[7] EMWG, *Minutes*, 9 October 2002, See also Appendix B3: Draft UCT Waste Management Plan
[8] Prof. Von Blottnitz, EMWG, *Minutes*, 9 October 2002
[9] See Appendix A2 for Letter of Appointment.
[10] See Appendix A1: Project Proposal
[11] See Appendix A1: Project Proposal

2. Waste Minimisation Overview

2.1 Waste – the problem

Waste costs money, consumes scarce resources, is difficult and expensive to dispose of, and can lead to environmental damage. Due to rapidly decreasing availability of land for disposal sites, emphasis will increasingly be placed on waste avoidance and minimisation. Thus companies and institutions will be under greater pressure to adopt sustainable waste management strategies. The positive side is that resource efficiency should save money and increase competitiveness.

Although landfilling has in the past been the cheapest and thus preferred disposal option, it is now becoming increasingly clear that it is the least desirable method of dealing with waste. There are a number of factors, both environmental and financial, which lead to this conclusion:

- Waste can pollute the water table as toxic chemicals are leached out of the waste.
- Landfill gas, which is mainly a mixture of methane (CH_4) and carbon dioxide (CO_2), is released when the organic fraction of waste rots. This leads to two major problems. Firstly, methane is explosive and there have been records of explosions being caused by the migration of landfill gas into surrounding houses, factories and warehouses. Secondly, methane and carbon dioxide are greenhouse gases and with current concerns over the impacts of global warming it is a good idea to limit their liberation.
- There are currently seven operating landfill sites in Cape Town. Six are operated by the Council, one is privately owned by Enviroserv and Wasteman. In five years there will be only two of the landfill sites still open, if Cape Town continues to produce the same amount of solid waste it does currently. With reduced space, costs of sending waste to landfill will escalate. Thus it is a good idea for institutions such as UCT to be proactive in reducing waste now.[1]

2.2 What is waste minimisation?

There are a number of definitions of waste minimisation, the simplest being:

A systematic approach to reducing the generation of waste ***at source.***

Waste minimisation aims to reduce the amount of waste which is sent to landfill sites. It is aimed at tackling the causes and sources of waste, rather than trying to address the symptom through treatment or recycling. The waste hierarchy shown below prioritises how to deal with waste.

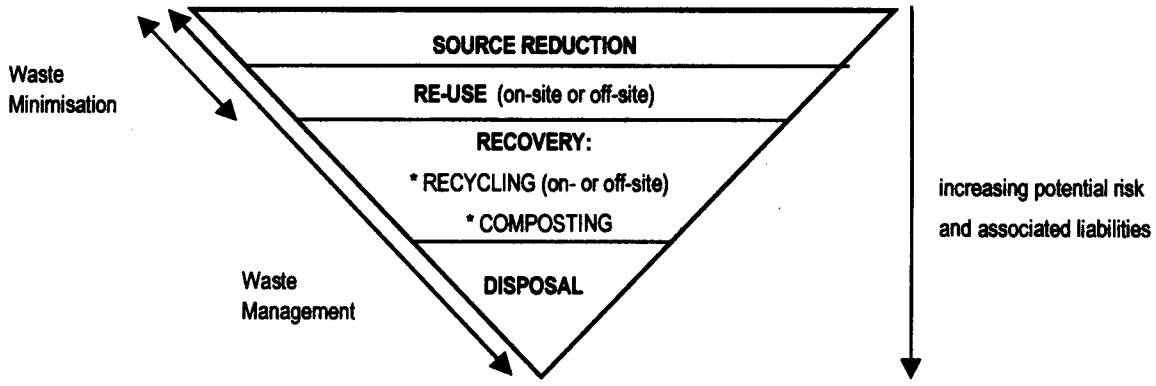

Fig 2.1: Waste Hierarchy [2]

Within the framework of this hierarchy, source reduction and re-use are the only true 'waste minimisation' techniques. The other options are essentially "end of pipe" techniques, which can be employed after the waste has been produced. Whilst they may reduce the amount of waste which goes to landfill, they do not prevent waste being produced. Reduction, which is actually better termed as "resource efficiency", tackles waste at the beginning of the process; a "start of pipe" technique.[3]

2.2.1 Source Reduction

The best option is to prevent or reduce waste *before* it is generated. Source reduction, often called waste prevention, means consuming and throwing away less. Source reduction measures include product changes, input or raw material changes, technology changes and good operating practices.[4] Examples include purchasing durable, long-lasting goods and seeking products and packaging that are as free of toxics as possible. Because source reduction actually prevents the generation of waste, it is the cheapest and most environmentally sound option.

2.2.2 Re-use

With re-use, the object is used for the same purpose again or for a different purpose (such as returning glass bottle to the cooldrink manufacturer for refilling.)[5] Re-use can also involve repairing items, donating them to charity and community groups, or selling them. It is preferable to recycling because the item does not need to be reprocessed before it can be used again.

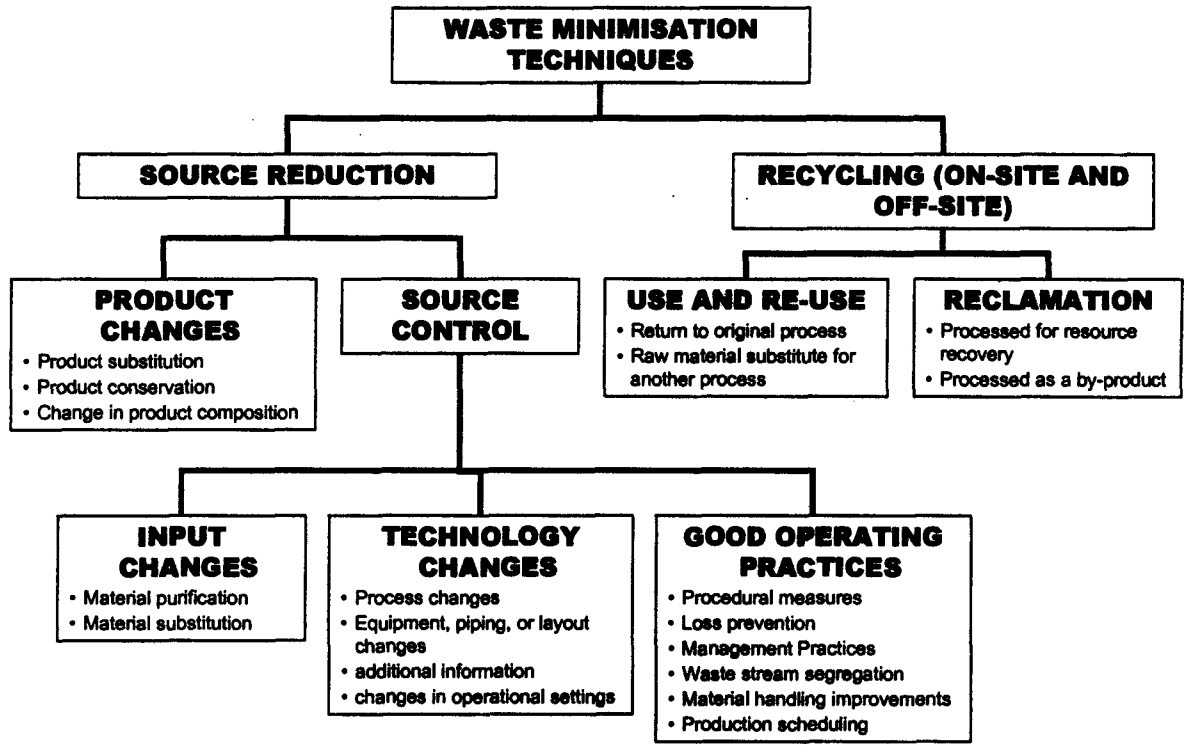

Fig 2.2: Overview of Techniques for Waste Minimisation[6]

2.2.3 Recovery

Recovery includes various ways of processing material so that it can be used again, such as the processing of waste paper to make pulp and then new paper.

Composting is the controlled biological decomposition of organic matter, such as food and garden wastes, into humus, a soil-like material. Composting recycles organic wastes into new soil which can be used in gardens, landscaping, and many other applications. Composting waste is beneficial as it keeps organic wastes out of landfills, while providing nutrients to the soil, increasing beneficial soil organisms such as earthworms, and reducing the need for fertilizers and pesticides.

Recycling is the separation of recyclable materials from non-recyclable materials for processing and use in new products. Another aspect of recycling is to buy recycled products. Buying materials with recycled-content helps develop a market for the waste materials recycled from other operations and "closes the loop."[7]

Recycling generates a host of environmental, financial, and social benefits, such as reducing waste disposal, creating new jobs, and income from sale of recyclable materials. However, although recycling does help to conserve resources and reduce wastes going to landfill, it is important to remember that there

are economic and environmental costs associated with waste collection and recycling processes. For this reason, recycling should really only be considered for waste which cannot be reduced or reused.

Energy recovery may be possible from waste which cannot be reduced, reused or recycled. This is a high-tech operation, with high initial implementation expenses, and thus is not advocated in this report.

2.3 The Benefits of Waste Minimisation

Waste minimization makes good economic and business sense. As well as reducing costs and increasing profitability, implementing waste minimisation measures can have many other benefits for both the organisation and the environment, as summarised in Table 2.1 below:

Table 2.1 Summary of Benefits of Waste Minimisation [8]

Waste minimisation measures can *reduce*:	**Waste minimization can *improve*:**
• The quantity and toxicity of hazardous and solid waste generation; • Purchasing costs; • Raw material and product losses; • Waste management costs; • Workplace accidents and worker exposure; • Compliance violations; and • Environmental liability.	• Profits; • Efficiency: efficient use of raw materials, energy and water means that the organisation can contribute to Sustainable Development; • Environmental performance: contributes to working towards an environmental management system; • Positive public image of the university; • Staff motivation, through working in a proactive and cleaner environment; and • Attitudes of students and staff.

2.4 The Cost of Waste

The cost of waste is much higher than many organisations realise. The direct costs of waste includes waste collection and disposal costs. However, the bulk of waste costs are indirect and therefore hidden. The true cost involves the time, energy and materials to produce the waste, and will be many times the cost of disposal. [9]

According to the UK Environment Agency, the true cost of waste includes:

The true cost of waste = disposal costs
+ purchase cost of materials
+ handling/processing costs
+ management time
+ lost revenue
+ any potential liabilities.
= much more than you realise!

- *disposal costs*, e.g. skip hire and lift, landfill contractor charges plus landfill taxes;
- *purchase cost of materials*, e.g. first quality material being disposed of through poor segregation policies meaning it cannot be re-worked in-house, increasing demand for virgin raw materials;
- *handling/processing costs*, e.g. adding on the operators' overheads (including energy and labour) to make the goods, test and package them, then dispose of them as waste. Included in this is energy - the inefficient use of energy resources; and salaries - paying employees for time spent collecting waste, arranging for its disposal or moving it to storage and for wasted time and effort;
- *rework costs* for in-process or customer rejected goods;
- *management time and monitoring costs*, e.g. managers need to be aware of what is being sent out, as waste producers have a legal responsibility for waste through to disposal;
- *lost revenue*, e.g. excess materials bought in and held on inventory and reduced capacity;
- *any potential liabilities*, e.g. fines, charges and imprisonment for voluntary or involuntary pollution or improper disposal of waste;

- *post-disposal segregation*, e.g. needing to separate different waste streams at the end of a shift rather than carrying out the segregation at source. [10]

From the perspective of individual businesses, the Environment Agency in the UK estimated in 1999 that the real cost of waste can be 5 to 20 times that of disposal. It can typically cost 4% of turnover, although it can be as much as 10%.[11]

The cost of waste is thus not only the cost of handling and disposal, but also the value of what is being thrown away. Waste is costly to produce in terms of time, effort, energy and materials, in addition to the cost of disposal and harm to the environment.

2.5 Waste Minimisation Programme

A Waste Minimisation Programme is an organized, comprehensive and continuous effort to systematically reduce the production of waste and its pollution load. [12]

Waste minimisation involves action in three areas: people, systems and technology.

People: many reductions in waste can be achieved through better operational practices ('good housekeeping'). Good housekeeping measures are procedural, administrative or institutional measures that a company can adopt to prevent waste. Waste generation often goes unnoticed and is just considered a byproduct of work. Greater awareness must be encouraged, centred on an understanding of the environmental issues and the recognition that less waste can mean a significant reduction in costs. Better operational practices can often be introduced with little cost and are therefore attractive.[13]

Systems: a systematic approach to measurement and control will highlight problems, enable targets to be set and maintain levels of efficiency. Process measurement is an essential step: "if you don't measure it, you can't manage it".

Technology: investment in new technology can improve productivity and reduce waste generation, giving very short paybacks.[14] Technology changes range from minor changes to the complete replacement of processes or equipment.

The following is a systematic approach for developing and implementing a waste minimisation plan:

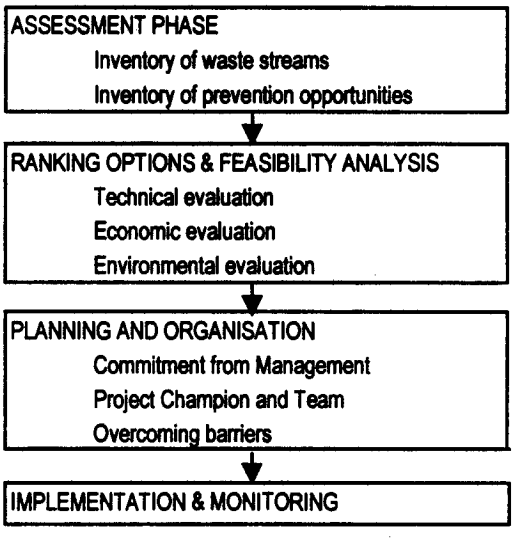

Figure 2.3: Outline of Steps in a Waste Minimisation Programme[15]

2.5.1 Assessment Phase

Inventory of Waste

An inventory of waste is taken by estimating the quantities generated and determining the composition of waste streams.[16] Waste minimisation programmes begin with data collection, most of the required data can be obtained by simply looking at the inputs and outputs of the business process. The first stage is to list all of the **input** materials which occur. These may include the following;

- *Raw materials*: materials forming part of the final product (at UCT this mostly applies to canteens and food production);
- *Ancillary materials*: materials used indirectly for production, e.g. materials for cleaning or maintenance;
- *Consumable materials*: materials for offices (paper and toner cartridges), computer consumables;
- *Packaging*: material used to pack and transport materials bought (such as polystyrene to package computers), and sold (such as food packaging).[17]

An analysis of **outputs** – what is being thrown away – is also necessary. At UCT the waste breakdown breakdown could be provided by DWS, who are sorting the University's solid waste.

Inventory of prevention opportunities

Waste reduction targets are set and methods of measuring and monitoring these targets.[18] The causes of waste generation and opportunities for waste minimisation are identified. Waste minimisation options are generated within the vision of eliminating or controlling each of the causes of waste generation. A brainstorming exercise with all relevant parties concentrating on a specific waste issue is a very good way to develop "less obvious" options of waste minimisation measures.[19] Particular attention should be paid to the following:

- Waste reduction opportunities that can be implemented quickly and easily. It is important, though, to ensure that a short-term saving does not limit future savings. Recycling a waste stream, for instance, may have cost benefits but it is better to reduce or eliminate this waste at source.[20]
- The biggest causes and kinds of waste: for example in the university environment, the canteens generate the most waste of any university sector, while paper waste is the largest kind of waste.
- Goods that are detrimental to the environment that need to be eliminated from the waste stream if possible.

2.5.2 Ranking of Options and Feasibility Analysis

The best options for waste reduction are prioritised, based on the waste hierarchy, how easy they are to implement and the cost of implementation. One should look for a few priority areas to reduce waste and save costs, rather than trying to undertake everything at once.[21]

Having generated a number of solutions to solve a waste minimisation problem, their technical and economic feasibility and their environmental impact should be assessed.

Technical assessment

Solutions should be assessed to see whether they are technically feasible. Pertinent questions include:

- Can this be done? Some solutions are too far-fetched.
- Is this solution appropriate to the problem.
- Does it solve the problem or fix the symptom? For example, a solution that identifies a recycle route for waste merely deals with the waste – it does not reduce or eliminate it.
- Who can implement this? Is external help needed or can it be done inhouse?
- When can it be implemented? Some solutions may take longer than others to come to fruition.

Economic assessment

An economic assessment of a potential solution to a waste minimisation problem includes:

- One-off cost of implementation (such as capital investment or work required).
- On-going cost of operating or maintaining the solution (such as running costs, inspection/auditing costs).
- The financial benefits from improved environmental performance .

In many cases a simple payback calculation is sufficient to assess the economic feasibility of a solution or to identify an optimum solution - one with lowest total costs for the business.

Environmental Assessment

The effect that any planned changes will have on the environment is assessed:

- Will the environment benefit? The environmental effects of proposed changes should be considered to ensure that the overall environmental burdens are minimised;
- Is the environmental problem being transferred elsewhere?
- Are there any environmental reasons for not proceeding with the project - could legislation affect its desirability in the future?
- Life-cycle assessments of products and processes can be carried out to identify those with the lowest environmental burden or impact.[22]

2.5.3 Planning and Organisation

Commitment from management and staff

A top-down approach is essential in ensuring that a culture of waste minimisation filters throughout the whole organisation.[23] Experience on many waste minimisation projects has shown that **senior management** commitment to waste minimisation is critical to success. Waste minimisation must complement the organisation's strategic vision and be integrated into the organisational culture to maximise the benefits.[24]

A project champion should be appointed who is enthusiastic and has the ability to motivate the project team and staff to maintain an interest in reducing waste. The champion should have the support of senior management and be credible, in order to put in place the necessary communications, resources, action programmes and training to make waste minimisation possible. S/he should have good knowledge of the organisation, as well as understanding of waste prevention principles and techniques.[25]

A **project team** should be established, involving employees from all levels in the organisation. It may involve a team of people from accounts, purchasing, production and environment functions.

The involvement of all staff is needed for identifying opportunities for waste reduction and for implementing any changes. However, not all staff will necessarily welcome the programme and may try to put barriers in the way. Such barriers can be overcome by taking the time to raise staff awareness and allowing people to contribute fully to the waste minimisation programme. [26]

Overcoming Barriers

The project team must be aware of potential barriers that can arise, for example:

- Existing contracts or stock may delay the substitution of an environmentally hazardous material with an enviro-friendly one – for example at universities with canteen contracts.
- There may be insufficient space for the installation of new equipment, or for storage. For example a recommendation to use returnable bottles at the canteens could be hampered by lack of storage space.
- A higher level of maintenance or quality control may be required.
- More repair work may be required – materials which were previously thrown away are now repaired.
- Changes in the typical characteristics of a product or material may not be accepted by staff or students.
- There may be insufficient resources to finance the project.
- Not enough staff-hours may be available to allow the project to progress.

Personal attitudes can also be an obstacle: especially resistance to change, and a negative attitude to the viability of the project.

2.5.4 Implementation and Monitoring

Improvements that have been identified should be implemented. Some solutions will be straightforward changes to operating procedures or simple technical changes to equipment. Other projects may involve changing peoples' attitudes and behaviour. Individuals will need to be more responsible for the consequences of their action or inaction. Environmental, health and safety, and business or cost awareness training could be a good way of delivering this information. Capital investment projects will need planning and integrating into the business plan, taking into consideration when the capital and manpower to manage and implement the project will be available.

A successful project relies on communication up and down the management structure to maintain momentum and commitment. Success stories should be communicated back to the whole organisation.

Once implemented, the project must be monitored in order to confirm the return on investment and to learn from any mistakes. Improvements should be continuously reviewed. Above all, a successfully implemented project helps to maintain momentum.

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[1] Susanne Dittke, City of Cape Town Waste Management Department. Personal communication 22 April 2003
[2] After:
- Common Ground and deVilliers Brownlie Associates (2003) *A Waste Minimisation Guideline Document For Environmental Impact Assessment (EIA) Reviews, for the Dept of Environmental Affairs and Development Planning*
- Scottish Environmental Protection Agency (2002) *Waste Minimisation Leaflet* available online at http://www.sepa.org.uk/publications/leaflets/wastemin/2002leaflet.pdf
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[4] Common Ground and deVilliers Brownlie Associates (2003) *A Waste Minimisation Guideline Document For Environmental Impact Assessment (EIA) Reviews, for the Dept of Environmental Affairs and Development Planning*
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[6] Common Ground and deVilliers Brownlie Associates (2003) *A Waste Minimisation Guideline Document For Environmental Impact Assessment (EIA) Reviews, for the Dept of Environmental Affairs and Development Planning*
[7] Common Ground and deVilliers Brownlie Associates (2003) *A Waste Minimisation Guideline Document For Environmental Impact Assessment (EIA) Reviews, for the Dept of Environmental Affairs and Development Planning*
[8] Scottish Environmental Protection Agency (2002) *Waste Minimisation Leaflet* available online at http://www.sepa.org.uk/publications/leaflets/wastemin/2002leaflet.pdf
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[12] de Hoo, S, H Brezet, M Crul and H Dieleman (eds) (1991) *Manual for the Prevention of Waste and Emissions* Netherlands Organisation of Technology Assessment. NOTA Publication, Rotterdam
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[14] Environment Agency (2001) *Waste Minimisation Good Practice Guide* available online at http://www.environment-agency.gov.uk/
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- de Hoo, S, H Brezet, M Crul and H Dieleman (eds) (1991) *Manual for the Prevention of Waste and Emissions* Netherlands Organisation of Technology Assessment. NOTA Publication, Rotterdam
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[16] IIR South Africa *Waste Management* online http://www.iir.co.za/courseOutline.asp?IDNum=374
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[26] Environment Agency (2001) *Waste Minimisation Good Practice Guide* available online at http://www.environment-agency.gov.uk/

3. Situational Analysis

A situational analysis involves analysing needs, problems and examining relevant research, knowledge and experience. The objective of a situational analysis for UCT is to build a foundation for making good decisions on waste minimization programme priorities and the use of limited university resources. Involving others in situational analysis helps to build a better understanding of the situation, hence the use of key stakeholder interviews in the study. Factors that have been considered in the situational analysis are:

- National laws and policies
- UCT Mission Statement, Talloires Declaration, Environmental Policy, PASE
- Lessons learned from past attempts at waste management at UCT
- Current waste management practice at UCT
- Waste minimisation practices at other universities
- Cost of landfill
- Role of environmental education

3.1 National Laws and Policies

The legal definition of commonly used terms such as "pollution" and "waste" is problematic,[1] because one person's waste may be another's raw material.[2] Nevertheless, there are common law principles, legislation and overarching policies, which are relevant to waste minimization, and consequently to the management of solid waste at UCT. A more detailed discussion on the problem of defining "waste" is provided for in Appendix C4.

3.1.1 Common Law Principles

Common law principles form the basis of current day law of neighbours and law of nuisance, which underlie contemporary South African law regulating waste management and pollution control.[3] The law of nuisance, in particular, has been extensively invoked in various forms of pollution generated on land.[4] The common law of neighbours and nuisance is pertinent to noise, odours and other forms of pollution that may arise from UCT's management of solid waste. A more detailed discussion on the Law of Neighbours and Law of Nuisance is provided for in Appendix C4.

3.1.2 National Legislation

The following pieces of legislation are pertinent to the development of a waste minimisation programme for UCT: The Constitution of the Republic of South Africa Act 108 of 1996, National Environmental Management Act 107 of 1998 and Environment Conservation Act 73 of 1989. They will be considered in turn below.

The Constitution of the Republic of South Africa, Act 108 of 1996

Although waste minimization is not specifically mentioned in the Constitution, the state has a duty to ensure that waste management and pollution laws are enacted to "prevent pollution and ecological degradation" and "promote conservation", and by implication a duty also to ensure that these laws are effectively applied and implemented.[5] UCT is subject to the promulgated legislation. In terms of the Bill of Rights (Chapter 2 of the Constitution), everyone has a right:

a) to an environment that is not harmful to their health or well-being; and
b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that –
   i. prevent pollution and ecological degradation;
   ii. promote conservation; and
   iii. secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.[6]

National Environmental Management Act 107 of 1998

Section 2 of the National Environmental Management Act (NEMA) lays down a number of principles that should be applied when considering the development of a waste minimization programme at UCT:

- "That pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;[7]
- That waste is avoided, or where it cannot be altogether avoided, minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner;[8]
- That the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource;[9]
- That the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised;[10]
- That a risk averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions;[11]
- Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle;[12]
- Community well-being and empowerment must be promoted through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate knowledge;[13]
- The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage;[14]
- 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;[15]
- The vital role of women and youth in environmental management and development must be recognised and their full participation therein must be promoted."[16]

Environment Conservation Act 73 of 1989

It is should be noted that the Environment Conservation Act (ECA) contains the sections that cover the prohibition of littering (S 19), waste management (S 20), and the identification and prohibition of activities which have a detrimental effect on the environment (S21 & 22). NEMA did not supersede these sections. Thus under the Act, the Minister has the power to make regulations with regard to waste management concerning:

> "(c) the classification of different types of waste and the handling, storage, transport and disposal of such waste;
> (e) the utilization of waste by way of recovery, re-use or processing of waste."[17]

3.1.3 National Strategy, White Papers and Declaration

National strategies, white papers and declarations, while not binding by law, are important because they represent emerging concepts and principles that may be incorporated into South African law in the future. The principles contained in the following policies are therefore pertinent to the development of a waste minimisation programme for UCT: National Waste Management Strategy and Action Plans, 1999; White Paper on Integrated Pollution and Waste Management for South Africa, 2000; White Paper on Education and Training, 1995; and the Polokwane Declaration on Waste Management, 2001.

National Waste Management Strategy and Action Plans, 1999

The National Waste Management Strategy and Action Plans (NWMS&AP) presents a long-term plan for addressing key issues, needs and problems experienced with waste management in South Africa.[18] The core objective of the NWMS&AP is to integrate pollution and waste management and so move away from the exisiting fragmented and uncoordinated waste management practices. The envisioned

integrated approach extends over the entire waste cycle from "cradle to grave", and covers the prevention, generation, collection, transportation, treatment and final disposal of waste.

White Paper on Integrated Pollution and Waste Management for South Africa, 2000

The White Paper on Integrated Pollution and Waste Management for South Africa (IP&WM) represents a paradigm shift for waste management in South Africa from a philosophy dealing only with waste after it is generated towards pollution prevention, waste minimization, cross-media integration (air, land, water), and the involvement of all sectors of society in pollution and waste management.

General techniques to achieve pollution prevention and waste minimisation will include, *inter alia*: policy and regulation, technical assistance and compliance monitoring, efficient use and conservation of natural resources, reuse and recycling, operating efficiencies, and economic incentives and disincentives. The overarching principles of this White Paper are those of the South African Constitution (Bill of Rights) and NEMA. Thus the Duty of Care Principle has been adopted which states that:

> *Any institution which generates waste is always accountable for the management and disposal of this waste and will be penalised appropriately for any and every transgression committed.*[19]

White Paper on Education and Training, 1995

The White Paper on Education and Training (E&T) states that:

> *The importance of environmental education, involving an interdisciplinary, integrated and active approach to learning, must be a vital element of all levels and programmes of the education and training system, in order to create environmentally literate and active citizens and ensure that all South Africans, present and future, enjoy a descent quality of life through the sustainable use of resources.*[20]

The Polokwane Declaration on Waste Management, September 2001

The Polokwane Declaration on Waste Management is a national declaration. It recognises that waste management is a priority for all South Africans and that there is a need for urgent action to reduce, reuse, and recycle waste in order to protect the environment. The goal was set to stabilize waste generation and reduce waste disposal by 50% by 2012 and to develop a plan for zero waste by 2022.[21]

3.2 UCT Mission Statement, Policy and Commitments

3.2.1 UCT Mission Statement

The Mission of UCT is:[22]

> *To be an outstanding teaching and research university, educating for life and addressing the challenges facing our society... Addressing the challenges facing our society means that we must come to terms with our past, be cognisant of the present, and plan for the future."*

From the above extract from UCT's Mission Statement, it can be concluded that the degradation of the environment, with all the socio-economic implications, is a major challenge facing society that will need to be addressed by the university. The development of a waste minimisation programme for resolving this challenge is therefore a responsibility of UCT.

3.2.2 Talloires Declaration

In 1990 Dr Stuart Saunders, the then Vice-Chancellor, signed the Talloires Declaration on Sustainable Development (Talloires Declaration) on behalf of UCT.[23] The declaration was initiated by university leaders from all over the world who had become concerned with the "...unprecedented scale and speed of environmental pollution and degradation and the depletion of natural resources".

As a signatory to the declaration UCT agreed to:

> *5) Practice Institutional Ecology: Set an example of environmental responsibility by establishing institutional ecology policies and practices of resource conservation, recycling, waste reduction, and environmentally sound operations.*

UCT has done very little to support the declaration's aims and objectives in the decade after its signing.[24] Vice-Chancellor, Professor Njabulo Ndebele, recommitted UCT to the Talloires Declaration in 2002.

3.2.3 Draft UCT Environmental Policy

Following the recommitment of the university to the Talloires Declaration, an environmental policy document was formulated by P&S. The document states that UCT will: [25]

- "Increase awareness of environmental issues amongst students, irrespective of their field of study, through the incorporation into courses of material on the environment and sustainable development.
- Promote research programmes aimed at achieving environmental responsibility and sustainable development as part of the University's central mission.
- Support the networking and interdisciplinary processing of environmentally relevant issues in research and teaching at the university, also in co-operation with other institutions.
- Encourage and provide education on environmental issues to University employees, so that they can pursue their work in an environmentally responsible way."

The relevant authorities in UCT have not yet approved the draft environmental policy and thus UCT is still without an official Environmental Policy to guide decisions.

3.2.4 Partnership for a Sustainable Environment (PASE)

The UCT Partnership for a Sustainable Environment (PASE), that aims to ensure that UCT is identified as the internationally recognised leader of research, teaching and outreach in the field of environmental sustainability within the African context, is in the process of being established.[26] PASE will seek to harness the collective teaching, research and outreach capacity of UCT to address the challenges of sustainable development more effectively. The Partnership hopes to transcend traditional academic lines to deliver focused interventions in the management of social, environmental and economic development. Through its activities, the Partnership aims to create a platform for collaboration with other institutions and professionals, becoming the hub of a network of people working towards a common goal of sustainable development. One of the objectives of PASE is:

> *To promote an ethos of sustainability at UCT to serve, amongst others, as an example for the wider community of the advantages thereof.*[27]

3.3 Lessons Learned from Past Attempts at Waste Management at UCT

UCT has tried many approaches to manage solid waste activities over the past few decades but with little success. [28] Table 3.1 below chronologically documents UCT's past initiatives in terms of their institutional arrangement, approach and provides a synopsis of lessons learnt. This table is a summary of Appendix C2.

Table 3.1 Lessons Learned from PreviousWaste Management Initiatives at UCT

Period	Administered by	Intervention / Approach	Synopsis of Lessons Learned
End of 1970's / early 1980's	Prof. Vincent Grandeur, Faculty of Civil Engineering	• Envirac Photo Project: aimed to photograph and display unacceptable littering behaviour • Bins were placed around the campus, but mainly in front of the Jameson building: One bin for glass and the other for paper. • Litter was not collected for almost a month to raise the awareness of litter on campus • Sought guidance from "Keep South Africa Tidy" to tackle the problem	• Students deliberately littered so that their photograph would be displayed in the students union building • Failed to change the attitudes of students - accumulating waste did not concern most students • Failed due to lack of student involvement – students did not separate paper & glass
1990's: 1992 - onwards	Frank Raimondo, Organisation of Applied Research (OAR) and the 'Green Team' - reported directly to the Deputy Vice-Chancellor.	• UCT Recycling Campaign: aim was to impress upon the UCT community the need to reduce consumption, re-use where possible, and recycle	• UCT was the first university in South Africa to institute a comprehensive recycling programme on campus • 'Reviva' , the first locally recycled paper in South Africa was produced - made available at UCT bookshop and UCT printing department • Ultimately failed due to increasing operation costs • The number of students involved in the recycling project was lower than the number of students that indicated a preference for a recycling programme - need to develop an 'internal locus of control' • Lack of appropriate structures to implement and manage the programme – institutional tension between centralized system and autonomous departments
1995	Mr Ellis Boban, graduate intern of P&S , Mr Duke Metcalf, P&S	• Campus divided into 'precincts', each with a curator who was responsible for all aspects of the environments in his/her area. • Reports about their precincts were to be submitted to the Estates Manager.	• Reports about precincts not being submitted to the Estates Manager.
1996	Mr Duke Metcalf, P&S	• 100 grey bins were placed around campus to capture cans and general waste. Bins were colour coded - yellow coded bins were for general waste; red coded ones were for cans.	• Students did not adhere to separation but used the bins for any waste.

3.4 Current Waste Management at UCT

UCT is a complex institutional system. The responsibility and cost of waste management at UCT is currently borne by P&S. P&S operates at a university-wide, centralised level, and is responsible for the entire UCT campus. However, the generation of most of UCT's solid waste is associated with departmental, residences and canteen activities.

In some instances, departments recycle paper and make money from doing so. In other departments no recycling is done at all. Sometimes cleaners personally separate out and recycle the paper. This institutional complexity is illustrated in Figure 3.1.

In the following section the current management of UCT's waste is described firstly at a university-wide, centralised level of procurement (inputs) and disposal (outputs). Then the procurement, reuse, recycling and disposal of waste as generated by the major solid waste producers, namely canteens and departments will be described.

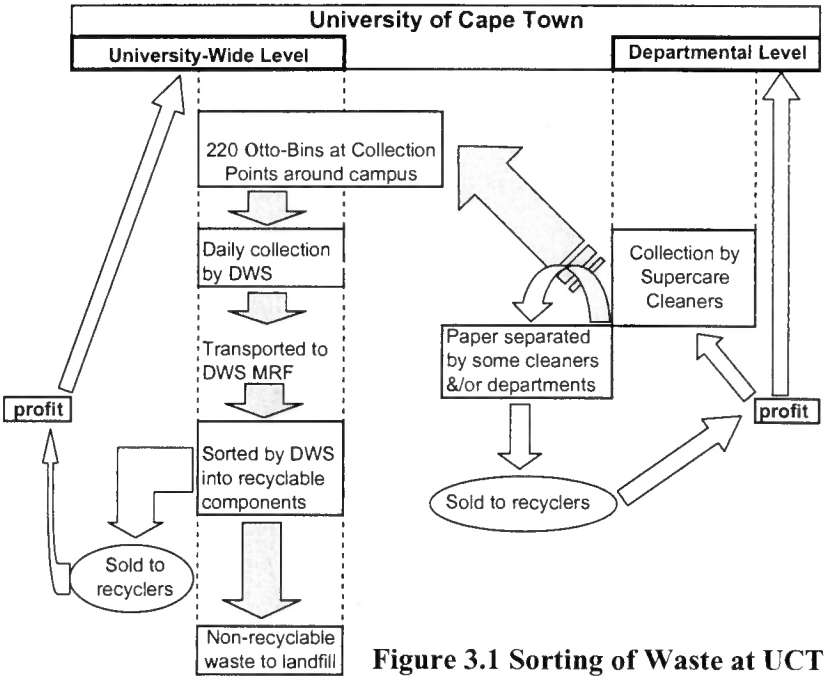


Figure 3.1 Sorting of Waste at UCT

3.4.1 University-Wide Level Management of Inputs and Outputs

Procurement of Inputs

The following emerged from an interview.[29]

- Departments are given a list of preferred vendors by UCT's Procurement Services but have autonomy over where and what is purchased.
- Procurement Services negotiate better rates from vendors of commonly bought products, such as paper and computer consumables.
- The administrative assistants of each department should enter everything purchased at UCT into the centralized SAP computer system. However, purchases are frequently not entered in the correct categories, with there being as much as a 40% margin of error. It is therefore not possible for UCT to ascertain its inputs reliably.
- Procurement Services has a policy that used printer and copier cartridges should be returned to the source from which they have been bought. A credit note should be issued, so that there is no opportunity for fraud. Most departments, however, seem to be unaware of this policy.
- Procurement Services is responsible for the purchasing and reuse of furniture. Broken furniture is repaired. Furniture that is no longer needed by one department is moved to other departments that could use it. When furniture is broken beyond repair, it is sold in job lots to one of three vendors.

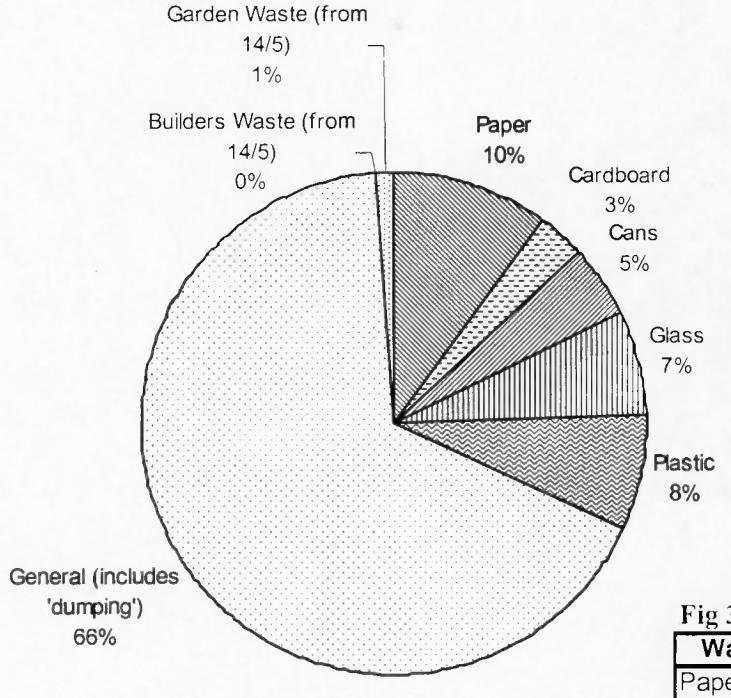
Disposal of Outputs

- After the collapse of the recycling campaign in the 1990's, solid waste was simply being transported and disposed of in landfill. Wasteman at the time was contracted to collect the waste.
- In September 2002 DWS was engaged to take over the responsibility for solid waste collection from Wasteman. (Wasteman has a 50% share in DWS.) UCT is charged R 38 000 per month for DWS service, less a minimum of R 5 000 income from the sale of recyclables.[30]

Collection	Solid waste is collected by DWS twice daily. The current Otto bins, also termed "wheelie bins" replaced the Wasteman skips, as the skips were considered aesthetically unattractive[31] and open to wind dispersal of waste.[32] A total of 220 Otto bins, each with a capacity of 240 litres, have been distributed across campus at collection points.[33] The solid waste from departments, canteens and workshops is collected in black bags and disposed of in the Otto bins.
Sorting	Originally the collected waste was delivered to a temporary MRF on university property in Avenue Road, Mowbray where the waste was sorted into various recyclable components. Due to concerns raised by the residents as well as site limitations, this on-site sorting was stopped. The waste is now sorted off-site at DWS MRF in Airport Industria Complex.
Selling & Final Disposal	The recyclable waste is compacted, bundled and weighed and is sold to specialist materials recyclers. The profit is then credited to UCT. The non-recyclable waste is weighed, compacted and transported to landfill. At present about one third of UCT's solid waste is being recycled; the rest, categorised as "general waste", is disposed of to landfill.
Recording & Display of Sorting Statistics	DWS records the daily separation of waste and displays the results on its web page.[34] (See Fig 3.2 below) This holds the potential for P&S to monitor the solid waste outputs from UCT, establish seasonal and annual trends, and determine which waste stream is most significant and therefore should be prioritised for a specific intervention. However, it has emerged that there are unexplained anomalies with DWS data.

The data showed marked variations in the daily recording of different types of waste. This is illustrated in Figure 3.3 below. For example, the minimum value for general waste recorded in the two months from 28 March to 27 May was 33.7 kg, while the highest value was 3.77 tonnes. The data is similarly skewed by unexplained high outliers for all types of waste.

Fig 3.2 UCT Waste 28 Mar - 27 May (DWS data)



Waste Type	Weight (kg)
Paper	8239.8
Cardboard	2612.31
Cans	3832.65
Glass	5545.74
Plastic	6220.33
General (includes 'dumping')	55079.9
Builders Waste (from 14/5)	160.7
Garden Waste (from 14/5)	811.8
Total	**82503.23**
Per day (tonnes)	1.38

Fig 3.3 Range of DWS data 28Mar - 27May

Waste Type	Min	Median	Max (kg)
Paper	10.5	150.2	505
Cardboard	8.8	39.4	161.7
Cans	6.8	62.7	218.7
Glass	18	90.5	520.9
Plastic	5.3	92.5	370.1
General	33.7	799.3	3769.3

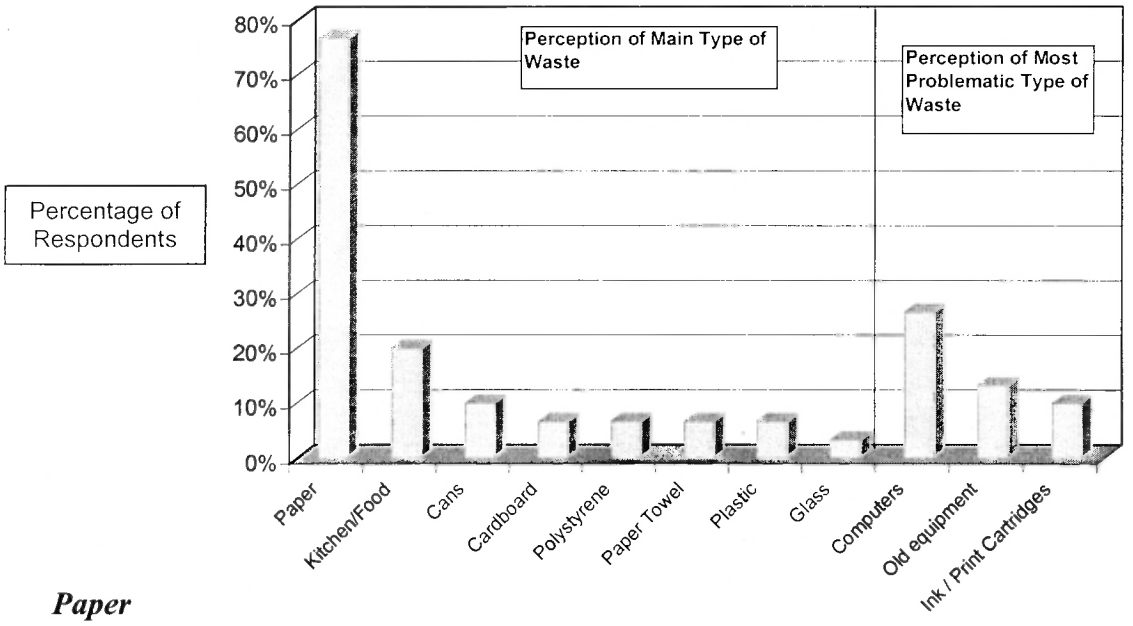
3.4.2 Departmental and Service Levels

Different departments and services within UCT, such as residence kitchens, canteens, Information and Communication Technology Services (ICTS) and administrative and academic departments, produce different kinds and amounts of waste. A selection of canteen managers and Heads of Departments have been interviewed concerning their solid waste practice. (See Appendix C.3 for excerpts from these interviews pertaining to solid waste.) Based on the interviews, perceptions of the main types of solid waste produced by departmental activities as well as the most problematic type of waste for departments have been presented in Figure 3.4 below.

As is illustrated in Figure 3.4, most departments view paper as the main type of solid waste produced. Kitchen / food waste was the second most remarked upon type of waste. Old computers and equipment were cited as the most problematic type of waste to dispose of at UCT, although ICTS have indicated that they accept old computers and reuse or dispose of them. It would appear that departments are unaware of this.

These three main types of solid waste, namely paper, computer equipment and kitchen / food waste, are discussed in separate sections below.

Figure 3.4 Departmental Perceptions of Main and Most Problematic Types of Solid Waste

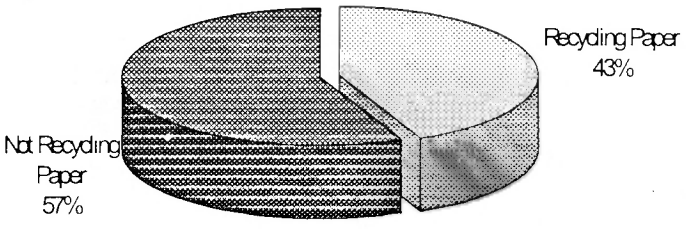


Paper

As illustrated in Figure 3.5, paper is being recycled by almost half the departments. This is being done either by the departments themselves or through private initiatives by Supercare Cleaners in cooperation with outside recycling companies. In at least one instance, a respondent questioned whether the income derived from recycling paper should not in fact go to the department and not to the cleaners.

DWS has requested that P&S stop all other paper recycling initiatives on campus because this, in effect, is undermining DWS business[35], as illustrated in Figure 3.1 above.

Figure 3.5 Recycling at a Departmental Level



Computer Equipment

The following arose out of an interview:[36]

- All computers and peripherals at UCT are purchased through ICTS thus making it the major purchaser of computer equipment at UCT.
- ICTS would like departments to buy into a 5-year replacement cycle for computers. The problem is that support costs come from a central budget, while replacement costs come from departments. Thus there is little incentive for departments to buy new machines as the real cost of keeping old machines does not accrue to the departments.
- Packaging is disposed of as waste.
- It would not be viable to insist that polystyrene & cardboard box packaging is returned to suppliers, as most things bought originate outside of South Africa.
- Departments could return bubblewrap to ICTS for reuse.
- ICTS does not advocate refilling laser or inkjet cartridges, because inferior ink/toner leads to maintenance problems and thus additional costs.
- ICTS was unaware of UCT Procurement policy that cartridges should be sent back to the source from which they were purchased.

Many of the respondents interviewed identified the disposal of obsolete computer equipment as a problem.[37] ICTS has a policy of taking back obsolete computers and peripherals and disposing of them in one of the following ways:

- Working but out of date machines are made available to staff, then to students. Anything left goes to charity. Applications are received from NGO's and charities. Usually machines cannot be reused because they are too old.
- Broken equipment is sent to scrappers, who recover components that are resaleable, and sell the rest for scrap metal.
- Cabling waste (copper wire) is sent to local scrap dealers. Old cables often are left in as it is too difficult and disruptive to remove them.

Food Waste

Nearly 20% of departments interviewed as part of the *Initial Review toward an EMS at UCT* cited food waste as a significant contributor to the solid waste stream. In interviews of the major producers of food waste, namely residence kitchens and canteens, it emerged that:[38] [39]

Residence Kitchens

- The bigger kitchens (e.g. Tugwell) cater for more than 600 students, while the smallest, University House, caters for about 300 students.
- Food is bought in bulk, usually packaged in cardboard boxes or plastic, plastic wrap (especially meat and fish) and large (5 litre) plastic bottles for milk and oil. Some of the packaging is returned to suppliers for reuse.
- Food is served on china crockery, which is washed in the kitchen dishwashers (i.e. re-used).
- Plastic or polystyrene packaging is only used for packed lunches, for those students who are unable to return to residence for lunch.
- Waste is roughly separated into specific bins for wet and dry waste, which is done to simplify the moving and storage of waste.

Canteens: The Food Court, Nescafe Coffee Shop and Leslie Canteen

- More than 4000 students pass through the Leslie Canteen each day and buy anything from a drink or cigarettes to full meals. About half of the food brought in ready-made (e.g. most of bakery items). Other foods, especially hot foods are made on site. Many of the products purchased are delivered in crates, which are returned. Otherwise they arrive packaged in plastic wrap and/or cardboard boxes. The Leslie kitchen is the biggest on campus.
- There is no separation of kitchen waste, unlike in the residence kitchens.

- Nearly all of the food for the Food Court is brought to campus ready for cooking – such as ready-made hamburger patties, and potatoes peeled and washed, thus there is little food waste in the canteen kitchens. Any raw food that is unusable is returned to the supplier.
- The Leslie Canteen sells the food in the cheapest viable way, which is usually polystyrene, greaseproof paper or cardboard. Similarly, the Food Court sells most of its food in greaseproof paper, plastic wrap or cardboard. Steers use polystyrene containers and 500ml drinks in non-returnable plastic bottles, as per company practice.
- In the Food Court and Nescafe Coffee Shop waste is simply left on tables by students for a cleaner to clear away, since there are insufficient bins. (Students gain no sense of responsibility for their waste – it is someone else's problem. Likewise, most students at the Leslie Canteen put their waste in rubbish bins or leave it on the tables for Supercare cleaners to clean up.)

3.5 Waste Minimisation at Other South African Universities

At present there are twenty-one public universities in South Africa. Over the past decade, South Africa has been grappling with the complexities of transformation. Consequently the focus of universities has been, and remains focussed on issues of social and economic transformation. Few universities have considered, let alone prioritised, environmental issues. In this regard South African universities lag behind the international trend of 'greening' campuses, ie. making campuses more sustainable. Examples from overseas universities have been incorporated into the next section (Section 4) to illustrate some waste minimisation options for UCT.

The seven universities listed below in Table 3.2 are the only South African universities that either have as a university objective a concern for the environment or are incorporating environmental concerns into the structure of university management. Only five of the seven universities, UCT being one of them, are signatories to the Talloires Declaration, with its related aims and objectives for sustainable campuses. The University of Port Elizabeth (UPE) is not a signatory to the Talloires Declaration but is the only South African university that has sought to implement an EMS (ISO 14001), although it is not yet officially certified.[40] Both UCT and Rhodes have expressed an interested in an EMS. UCT is about four years behind Natal University in terms of its development of a recycling programme.[41]

Table 3.2 Waste Minimisation at South African Universities

University	Vision / Mission includes the Env	Aims/ Objectives includes the Env	Signatory to Talloires Declaration	EMS (ISO 14001)	Env Policy	Recycles	Composts / Mulches
UCT	✗[42]	✗[43]	✓[44]	✗ but interested[45]	✗ draft[46]	✓ 34%[47]	✓[48]
Natal	✗[49]	✓[50]	✓[51]	✗	?	✓ 55%[52]	✓[53]
Rhodes	✗[54]	✓[55]	✓[56]	✗ but interested[57]	✓[58]	✓ 35%[59]	✓ + Pig's swill[60]
UWC	✗[61]	✓[62]	✓[63]	✗[64]	✗[65]	?	?
Wits	✗[66]	✗[67]	✓[68]	✗[69]	✗[70]	?	?
Stellenbosch	✗[71]	✗[72]	✗	✗[73]	✓[74]	✓[75]	✓
UPE	✗[76]	✓[77]	✗	✓[78] but not compliant[79]	✓[80]	✓[81]	✓[82]

3.6 Cost of Landfill

The following situation affects UCT solid waste management practices:

- Disposal costs at landfill sites in South Africa have increased by 700% since1991.[83]
- Disposal costs increased by 88% in Cape Town in 1999, and will continue to increase sharply as landfill space diminishes. [84] Four out of the six landfill sites that serve Cape Town will close down within the next four years. [85]
- Given the anticipated increasing costs of disposal to landfill, UCT should benefit from a waste minimization programme, because significantly less waste will be sent to landfill (currently 30% less[86]) through the reduce, reuse and recovery of solid waste from the general waste stream.
- However, UCT presently pays about R1 million per annum to the City Council whether or not it disposes of its waste at a municipal landfill site.[87] Thus there is little financial incentive, at this level, for UCT to minimize solid waste as they will not benefit from a reduced charge.
- UCT presently has a contract with DWS to collect and sort all solid waste. This costs UCT R38,000 per month as a service fee, but UCT recoups at least R5000 per month from the sale of the recovered recyclable materials.[88]

It has not been possible to consider costs for UCT in detail for the reasons given in Section 1.4.

3.7 The Role of Environmental Education

Societies are faced with making an unprecedented and historic change in a short period of time if they are to achieve a sufficiently sustainable form. Environmental education therefore is a crucial consideration if UCT is to change in order to be a more sustainable campus with respect to the minimisation of solid waste.

3.7.1 "Greening" Universities

The term "greening" is commonly used to describe the integration of environmental perspectives into the corporate work of universities.[89] In universities greening is often heavily dependent on the role of individual champions.[90] Alternative and innovative change, appealing in theory, is more radical and difficult to construct and implement.[91]

Universities are conservative, bureaucratic and traditional institutions, so change tends to be implemented by top-down decrees, formal structures and line management systems.[92] Bottom-up experiments and creative innovations are possible but are over-dependent on individual and voluntary enthusiasm.[93] However, environmental responsibility is neither a top-down nor a bottom-up issue. It is a shared responsibility by each individual member of that institution.[94]

3.7.2 Environmental Responsibility

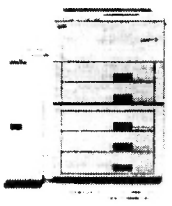
Traditional Thinking

The traditional thinking has been that simply making people more aware about the environment and its associated issues can change human behaviour. The assumption is made that if people are more knowledgeable, they will become more aware of environmental problems and so be motivated to act towards the environment in a responsible way.[95] Research does not confirm the validity of this assumption.[96]

Environmental Sensitivity and Empowerment

Environmental awareness is not enough. Knowledge from awareness campaigns does not directly equate to a change in behaviour. A person's environmental sensitivity, an empathetic perspective toward the environment, has been shown to have a dramatic relationship to responsible behaviour. [97] Thus experiential learning through UCT activities, outdoors clubs and fieldtrips has an important role to play in sensitising an individual to their environment.

Furthermore, when individuals have an in-depth understanding and personal investment in issues they are more inclined to take on responsibility toward those issues. [98] Raising the level of awareness through regular articles or a waste barometer (See example in Appendix C6) in the Monday Paper, and campus-wide campaigns, if providing staff and students with the opportunity for a more in-depth understanding and personal investment in the issues, may increase their inclination to actively participate in a waste minimisation programme at UCT.



Empowering staff and students to actively participate in a waste minimisation programme is crucial. The knowledge and perceived skill in using environmental action strategies is one of the very best predictors of behavior and are fairly easy to teach to learners. [99] For example, teaching staff and students how to photocopy double-sided and print two pages to a sheet are easy skills to learn and is empowering. An individual's belief that he or she can effect change is also more likely to act. [100]

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[1] Glazewski, J. (2000), *Environmental Law in South Africa*, Butterworths, Durban, p672
[2] Glazewski, J. (2000), *Environmental Law in South Africa*, Butterworths, Durban, p672
[3] Glazewski, J. (2000), *Environmental Law in South Africa*, Butterworths, Durban, p12
[4] Glazewski, J. (2000), *Environmental Law in South Africa*, Butterworths, Durban, p679
[5] Glazewski, J. (2000), *Environmental Law in South Africa*, Butterworths, Durban, p678
[6] The Constitution of the Republic of South Africa, Act 108 of 1996, Section 24 (S 24)
[7] National Environmental Management Act, (NEMA) (1998) S 2, (4)(a)(ii)
[8] NEMA (1998) S 2, (4)(a)(iv)
[9] NEMA (1998) S 2, (4)(a)(v)
[10] NEMA (1998) S 2, (4)(a)(vi)
[11] NEMA (1998) S 2, (4)(a)(vii)
[12] NEMA (1998) S 2, (4)(e)
[13] NEMA (1998) S 2, (4)(h)
[14] NEMA (1998) S 2, (4)(o)
[15] NEMA (1998) S 2, (4)(p)
[16] NEMA (1998) S 2, (4)(q)
[17] Environment Conservation Act 73 (1989) S 24 (c) and (e)
[18] National Waste Management Strategy and Action Plans, Version D dated 15 October 1999
[19] White Paper in on Integrated Pollution and Waste Management for South Africa, in *Government Gazette* No. 20978 dated 17 March 2000
[20] White Paper on Education and Training (1995) available online at http://www.gov.za/whitepaper/1995/education1.htm
[21] The Polokwane Declaration on Waste Management, Department of Environmental Affairs and Tourism, Polokwane, 26-28 September, 2001.
[22] See Appendix B1: UCT Mission Statement
[23] See Appendix B4: The Talloires Declaration (1990); available online at http://www.ulsf.org/programs_talloires_signatories.html#SouthAfrica
[24] Environmental Management Working Group (EMWG), *Minutes*, 11 May 2001
[25] See Appendix B2: Draft UCT Environmental Policy.
[26] Only available online at http://www.pase.uct.ac.za/about.php
[27] Draft PASE Constitution, Section 3.5, http://www.pase.uct.ac.za/constitution.php
[28] See Appendix C2 for more information on past waste management initiatives at UCT.
[29] Interview with Mr Trevor Adams, Head of Procurement and Payment Services, Mr John Pretorius (Manager: Vendor Management), Ms Di de Villiers and Mr Craig Golding (Vendor Management Officers), by Margaret Matthew, 14 April 2003
[30] Duke Metcalf and Lillian Campbell, interview by MPhil group, 31 March 2003
[31] Monday paper November 2 – 9 (1992) volume 11 (35).
[32] Duke Metcalf and Lillian Campbell, interview by MPhil group, 31 March 2003
[33] Memorandum- general feedback; EMWG matters; 6 June 2001
[34] Figures from Don't Waste Services website: http://www.dontwaste.co.za/
[35] Jeremy Droyman, Director of DWS, Email correspondence, 12 June 2003
[36] Dr Fred Goldstein and Brian King, ICTS, interviewed on 22 April 2003
[37] See Appendix C3 for a summary of waste issues raised in interviews for the *Initial Review Toward an Environmental Management System at UCT*

[38] Ms Ann Chong, Residence Catering Manager, was interviewed on 17 April 2003.
[39] Interviewed on 23 April: Alasdair Cunningham, Manager of the Food Court on Cissie Gool Plaza, and Wayne Tzemis, Manager of the Leslie canteen and various smaller canteens on the south side of Upper Campus.
[40] Mr. Riaan Louw, Safety, Health & Environment Manager, University of Port Elizabeth, Personal Communication, 6 May 2003
[41] John Critien, Director of P&S, interviewed by Sandra Rippon, EMS Study, 17 May 2003
[42] University of Cape Town website: http://www.uct.ac.za/
[43] University of Cape Town website: http://www.uct.ac.za/
[44] http://www.ulsf.org/programs_talloires_signatories.html
[45] Team appointed in 2003 to conduct: *An initial review toward an Environmental Management System at UCT*
[46] See Appendix B.2: UCT DRAFT Environmental Policy
[47] Figures from Don't Waste Services website: http://www.dontwaste.co.za/
[48] Site visit by MPhil team to Mulching Site above the Educare Centre, upper campus, UCT
[49] University of Natal website: http://www.nu.ac.za
[50]University of Natal website: http://www.nu.ac.za
[51] http://www.ulsf.org/programs_talloires_signatories.html
[52] DWS data for University of Natal http://www.nu.ac.za/dontwaste/
[53] Meeting with John Critien, Director: P&S, April 2003
[54] Rhodes University website http://www.rhodes.ac.za/general/dedication.html#vision
[55] Rhodes University website http://www.rhodes.ac.za/general/dedication.html#VALUES
[56] http://www.ulsf.org/programs_talloires_signatories.html
[57] Mr. Mark Hazell, Head of Grounds & Gardens, Rhodes University, Personal Communication, 10 June 2003
[58] Rhodes University website http://www.rhodes.ac.za/environment/policy.htm
[59] Mr. Mark Hazell, Head of Grounds & Gardens, Rhodes University, Personal Communication, 10 June 2003
[60] Mr. Mark Hazell, Head of Grounds & Gardens, Rhodes University, Personal Communication, 10 June 2003
[61] University of Western Cape website http://www.uwc.ac.za/about/indexr.htm
[62] University of Western Cape website http://www.uwc.ac.za/about/indexr.htm
[63] http://www.ulsf.org/programs_talloires_signatories.html
[64] University of Western Cape website http://www.uwc.ac.za
[65] University of Western Cape website http://www.uwc.ac.za
[66] University of the Witwatersrand website http://www.wits.ac.za/depts/wcs/about.shtml
[67] University of the Witwatersrand website http://www.wits.ac.za/depts/wcs/about.shtml
[68] http://www.ulsf.org/programs_talloires_signatories.html
[69] University of the Witwatersrand website http://www.wits.ac.za
[70] University of the Witwatersrand website http://www.wits.ac.za/depts/wcs/about.shtml
[71] University of Stellenbosch website http://www.sun.ac.za/university/Mission/Mission.html
[72] University of Stellenbosch website http://www.sun.ac.za/university/Mission/Mission.html
[73] University of Stellenbosch website http://www.sun.ac.za
[74] University of Stellenbosch website http://www.sun.ac.za
[75] University of Stellenbosch website http://www.sun.ac.za
[76] University of Port Elizabeth website http://www.upe.ac.za/start.asp
[77] University of Port Elizabeth website http://www.upe.ac.za/start.asp
[78] University of Port Elizabeth website http://www.upe.ac.za/green/homepage.htm
[79] Mr. Riaan Louw, Safety, Health & Environment Manager, University of Port Elizabeth, Personal Communication, 6 May 2003
[80] University of Port Elizabeth website http://www.upe.ac.za/green/homepage.htm
[81] Mr. Riaan Louw, Safety, Health & Environment Manager, University of Port Elizabeth, Personal Communication, 6 May 2003
[82] Mr. Riaan Louw, Safety, Health & Environment Manager, University of Port Elizabeth, Personal Communication, 6 May 2003
[83] City of Cape Town, Integrated Waste Exchange, http://www.capetown.org.za/iwe/Why_use_IWEX.asp
[84] City of Cape Town, Integrated Waste Exchange, http://www.capetown.org.za/iwe/Why_use_IWEX.asp
[85] City of Cape Town, Integrated Waste Exchange, http://www.capetown.org.za/iwe/Why_use_IWEX.asp
[86] Figures from Don't Waste Services website: http://www.dontwaste.co.za/
[87] John Critien, Director of P&S, interviewed by Sandra Rippon, EMS Study, 17 May 2003
[88] Duke Metcalf and Lillian Campbell, interviewed by MPhil group, 31st March 2003
[89] Alabaster, T. and Blair, D. Chapter 6: Greening the University *in* Huckle, J and Sterling, S. (1996), *Education for Sustainability*, Earthscan Publications Ltd, London, p86
[90] Alabaster, T. and Blair, D. Chapter 6: Greening the University *in* Huckle, J and Sterling, S. (1996), *Education for Sustainability*, Earthscan Publications Ltd, London, p86

[91] Alabaster, T. and Blair, D. Chapter 6: Greening the University *in* Huckle, J and Sterling, S. (1996), *Education for Sustainability*, Earthscan Publications Ltd, London, p102
[92] Alabaster, T. and Blair, D. Chapter 6: Greening the University *in* Huckle, J and Sterling, S. (1996), *Education for Sustainability*, Earthscan Publications Ltd, London, p102
[93] Alabaster, T. and Blair, D. Chapter 6: Greening the University *in* Huckle, J and Sterling, S. (1996), *Education for Sustainability*, Earthscan Publications Ltd, London, p102
[94] Alabaster, T. and Blair, D. Chapter 6: Greening the University *in* Huckle, J and Sterling, S. (1996), *Education for Sustainability*, Earthscan Publications Ltd, London, p103
[95] Hungerford, H. and Volk, T (1992) Changing Learner Behaviour Through Environmental Education, *American Journal of Environmental Education*. Vol. *21* (3), 8-21.
[96] Hungerford, H. and Volk, T (1992) Changing Learner Behaviour Through Environmental Education, *American Journal of Environmental Education*. Vol. *21* (3), 8-21.
[97] Hungerford, H. and Volk, T (1992) Changing Learner Behaviour Through Environmental Education, *American Journal of Environmental Education*. Vol. 21 (3), 8-21.
[98] Hungerford, H. and Volk, T (1992) Changing Learner Behaviour Through Environmental Education, *American Journal of Environmental Education*. Vol. 21 (3), 8-21.
[99] Hungerford, H. and Volk, T (1992) Changing Learner Behaviour Through Environmental Education, *American Journal of Environmental Education*. Vol. 21 (3), 8-21.
[100] Hungerford, H. and Volk, T (1992) Changing Learner Behaviour Through Environmental Education, *American Journal of Environmental Education*. Vol. 21 (3), 8-21.

4. Waste Minimisation at UCT

> Whether recycled or landfilled, once waste is generated it must be managed, collected, and transported at considerable and rising expense to the University. Any effort to **reduce the generation of waste at its source** would be the most prudent approach . . . The potential benefits . . .are enough to justify the effort.
> — *University of Michigan Environmental Task Force Report, 1990*[1]

An enabling environment of policies and structures is needed to create the foundation for a successful waste minimisation programme at UCT. Lack of appropriate structures was one of the reasons for failure of previous waste initiatives at the University. (See Section 3.3)
Once policies and structures are in place, the steps in a Waste Minimisation Programme outlined in Section 2.5 can be followed. Fig 4.1 on the right is an adaptation of Fig 2.3, to illustrate this point.

This section deals firstly with these structures as well as broad changes that would apply to all levels of waste minimisation, before going on to discuss other suggestions, fitting them loosely within the steps of Fig 4.1. Within the assessment phase, the inventory of prevention opportunities is considered in terms of the waste minimisation hierarchy categories, namely reduction, reuse and recovery of waste.

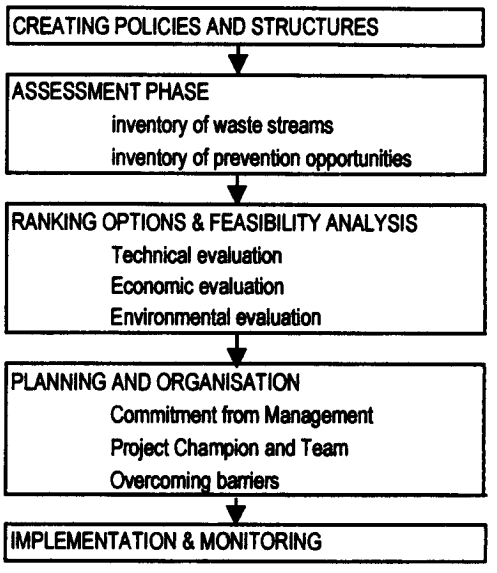


Figure 4.1: Steps in a Waste Minimisation Programme[2]

4.1 Creating Policies and Structures

There are numerous ways to regulate and encourage waste reduction, but it is usually essential to get institutional 'buy in' through explicit policies. At UCT policies would help to create the structures on which a waste minimisation programme should be founded.

4.1.1 Policies

Policies to promote waste minimisation, and the necessary structures to support it should be set at the central level. These form the basic structure on which a waste minimisation programme rests – their absence was a key reason for the failure of previous waste minimisation initiatives at UCT.[3]

The **Environmental Policy**, which is currently at final draft stage, should be approved. It forms the overarching rationale behind the University's efforts to be more concerned with environmental impacts, as illustrated by the waste minimisation programme.

A **Waste Minimisation Policy** should be developed, approved and implemented. The policy should include incentives to encourage students and staff to participate actively. UCT currently has a Waste Management Plan at draft stage (see Appendix B3), however this has limitations and should rather be reformulated into a Waste Minimisation Policy, based on this study

An enviro-friendly **Purchasing Policy** should be initiated to ensure that impacts on people and ecosystems are minimised. The key functions of this policy would be to

- Encourage the purchasing of more durable goods, and goods that can be repaired when broken, over things that are thrown away after one use;
- Encourage the purchasing of recycled goods;
- Encourage the acquisition of computers and photocopiers that have reusable / refillable toner cartridges;
- Exclude, where possible, goods that are detrimental to the environment, either by polluting or not biodegradable – such as polystyrene, which does not biodegrade in landfill.

A **Return of Packaging Policy** could be set up to encourage all suppliers to use less packaging for their products. If products are shipped directly from an overseas supplier, this policy would be waived, but the supplier should be encouraged to reduce packaging wherever possible.

Contracts with canteens and other food providers on campus should be renegotiated, to specify a ban on unnecessary packaging for food, and specifically on polystyrene use. Reusable cups (and possibly plates) should be sold and canteens encouraged to give a discount to students using these. [4]

4.2 Assessment of Waste Streams and Prevention Opportunities

Far from fitting in with the hierarchy of waste minimisation, UCT's current waste management seems closer to the diagramme below.

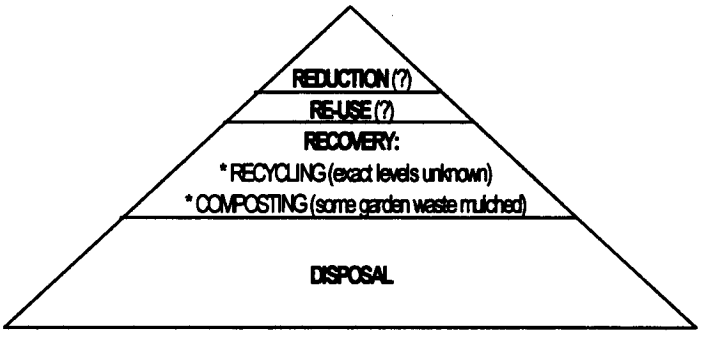


Figure 4.2 Current Waste Management at UCT?

In order to change this around, a waste audit – an assessment of the UCT waste streams – is necessary before a waste minimisation programme can be started. An audit would look at all 'inputs' (such as from purchasing, or packaging) and all outputs (which include waste currently being sorted by DWS) to ascertain priority areas for minimising waste.[5]

An inventory of prevention opportunities has been the main focus of the research for this report. The findings together with specific recommendations for waste minimisation at UCT are presented below. They are organised in waste hierarchy categories described in Section 2.

4.2.1 Source Reduction

In waste minimisation, the best option is to prevent or reduce waste before it is generated. Source reduction means greater efficiency: processes are streamlined so that fewer inputs and materials are necessary – thus saving on purchasing costs. Source reduction prevents the *generation* of waste, so it is the cheapest and most environmentally sound option. Reduction at source includes process changes, (such as good housekeeping measures), technological changes, and changes in input materials.[6]

Major waste streams should be identified as part of a waste audit, and processes should be developed to reduce these in particular. Goods that are detrimental to the environment should also be eliminated from the waste stream as far as possible. At UCT a preliminary scan suggests that **paper** is the largest category of waste (based on figures from DWS, as well as departmental interviews. See section 3.4). The **canteens** are a major source of waste, based on the number of Otto bins collected from pick-up points near to canteens. Canteens also currently use a lot of polystyrene containers for food and drink. Polystyrene is environmentally unfriendly because it takes a long time to decompose. These two areas, namely paper and canteen packaging, are dealt with in more detail below.

Reducing use of paper

Departments should be encouraged to follow guidelines such as:

- Buying printers and photocopiers that are capable of reduction and duplex (double-sided) printing.
- Setting up access to printers through a print counter, so that students and staff pay for all pages printed. This will encourage greater frugality, saving paper and printing costs.

- Encouraging all staff and students to keep scrap paper to be re-used for printing on the reverse side. A box should be kept next to each photocopier and printer to collect this paper.
- Buying a second printer to be used only for draft printing: it should be filled with the scrap paper collected, to print on the other side. The cost of printing to this printer should be significantly less than to the main printer, to encourage people to use it for draft materials. Lower quality print, too, could add to savings on the second printer.

Training

Staff and students should be trained on how to use the duplex and reduction features of printers and photocopiers.

- Posters could be put up in printer rooms, describing the method of printing double-sided or several pages on one sheet from commonly used applications such as MsWord, Internet Explorer and Acrobat Reader.
- ICTS applications training courses should include a brief section on using these features.
- Information about optimum use of printers could also be put on the ICTS website training sections.

Reducing packaging in canteens

Canteen managers should be encouraged to reduce the quantity of waste that is produced by the canteens. According to interviews conducted with the managers of the two biggest food areas on Upper Campus, most of this waste comes from packaging of products sold. Polystyrene is widely used in packaging as it is usually the cheapest alternative. The best way to reduce packaging is through use of crockery and re-usable cups. This is covered in more detail in the following section.

4.2.2 Re-use of Waste

In "re-use", an item is used for the same purpose again (such as returning glass bottles to the cool drink manufacturer for refilling) or for a different purpose.[7] Re-use can also involve repairing items, donating them to charity and community groups, or selling them. It is preferable to recycling because the item does not need to be reprocessed before it can be used again. At UCT, specific re-use recommendations are described for cafeterias, residences and computer equipment. Cafeterias are particularly targetted as the way waste is currently handled should be improved. Waste is usually left on tables, thus students gain no sense of responsibility for their waste – it is someone else's problem.

Refillable Cups

UCT could mandate that refillable cups replace polystyrene cups. This would significantly reduce the amount of polystyrene waste generated from cafeterias. Cups could be sold for about R10,[8] and a discount of R1 or R1.50 given if the cup is presented by the person purchasing a drink. The refillable cups could be used for both hot and cold drinks, thereby reducing the number of cans and plastic bottles used.

> ***Food services at University of Waterloo, Canada***[9]
> *Special portable insulated mugs are sold to students by campus food outlets. This program is very successful (20,000 sold) and has reduced the use of Styrofoam cups from one million a year to 500,000. Some coffee shops and faculties have banned the use of disposable cups altogether. During 1992-1994 the feasibility of the elimination of Styrofoam cups on campus was evaluated. A "no disposal cup" day on campus was held in October 1993. A dinosaur, made up of the 3000 disposal cups used daily on campus, was displayed in the Campus Centre.*

It is essential that the refillable cups be a standard size, acceptable in all the cafeterias across campus. A 500ml mug could be manufactured, marked at different levels (200ml, 350ml, 500ml) for coffee and cold drinks. UCT clubs or companies could brand the refillable cups. The use of refillable cups could be sustained through incentives like discounts on drinks for using the cup[10]. The discounts should be big enough that after buying coffee/coke several times the capital cost of the cup is recovered. There are examples of refillable insulated cups that have been designed so that the coffee remains warm and the coke remains cold for an extended period of time.

Cafeterias could also start using a cooldrink dispenser, instead of selling drinks in cans or plastic bottles. One of the Food Court vendors is already dispensing cold drinks in cups. Refillable cups should be used in place of disposable cups.

The use of refillable cups should be encouraged by not making polystyrene cups available at the canteens, or making them relatively expensive. UCT could incorporate the banning of polystyrene in the contracts with cafeterias. In franchises on campus such as Steers, changing packaging would involve the Steers SA management – this may have the knock-on benefit of heightening awareness and changing policies in Steers in general.

Reusable Plates

A similar idea could be used for plates. Food in the cafeterias is currently being served on polystyrene or cardboard plates and eaten with plastic knives and forks which are thrown away after use. The shift from use-and-throw type materials to reusable plates and utensils would reduce the solid waste generated, but it would also increase the consumption of water and electricity as a result of increased washing. Moreover, there is limited space in kitchens to install washing facilities. Theft of plates and cups by students is likely to be a costly problem.

A possible solution to the above problems would be to ask the students to bring their own plates along with them to the canteens, for a discount on the cost of their meal. Facilities where students can wash their plates could be provided in the vicinity of the canteens.

Returnable Bottles

Cans and plastic bottles make up a large proportion of the waste collected from canteen areas. A reduction in this waste stream could be achieved by replacing disposable cans and plastic bottles with returnable glass or plastic bottles. Students pay for the cooldrink as well as a deposit, which provides an incentive to return the bottle. Empty bottles can be sent back to the suppliers for refilling.

Cafeteria managers highlighted the following problems with this proposal:

- Extra staff time at tills, and
- Queues in canteens to return bottles for a refund.
- Space to store the bottles is limited, especially as the storage area would have to be secure so that the bottles would not be stolen.

These problems could be solved by having one or two dedicated kiosks on campus for return of bottles.

Encouraging Re-use at Residence Halls

At the end of each semester when students leave their residences they often discard items that are no longer of any use such as old clothes, books and furniture. These items may be useful to some disadvantaged communities in Cape Town. This "waste" can be collected, sorted and redistributed. Collection bins could be provided in residence halls at the end of each semester (or quarter) and students encouraged to donate their old clothes and other materials.[11] This would have the added benefit of raising student awareness of the broader communities needs. The coordination and monitoring of this activity should be delegated to the warden at each residence. To ensure continuity this activity could be set as one of the duties of the warden, rather than it just being left to a "champion". A competition between residences could be held to encourage participation in the project.

4.2.3 Recovery of Waste

In "recovery", materials which can be reprocessed and put to other beneficial uses, are separated from general waste that goes to landfill. This can happen in several different ways. Recycling and composting (of garden waste together with food waste from residence kitchens), are viable options at UCT.

Composting

Composting is the controlled biological decomposition of organic matter, such as food and garden wastes, into humus, a soil-like material. Composting is nature's way of recycling organic wastes into new soil used in vegetable and flower gardens, landscaping, and many other applications. Composting waste is

beneficial as it keeps organic wastes out of landfills, while providing nutrients to the soil, increasing beneficial soil organisms such as earthworms, and reducing the need for fertilizers and pesticides.

All composting 'ingredients' generally fall under one of two categories-'browns' (carbons) or 'greens' (nitrogens).

- Browns are dry materials such as wood chips, dried leaves, grass and other plant materials, as well as paper and cardboard.
- Greens are fresh moist materials such as grass cuttings and food scraps (fruits, vegetables, coffee grounds).
- Non-composting: Meat, bones, cheese mayonnaise, garlic, peanut butter, butter have been identified as not suitable for composting.[12]

UCT currently keeps 'browns' from garden waste and mulches them for use on the campus gardens. If food waste from residence and cafeteria kitchens were added to this, proper compost could be made, which would be more beneficial. Instituting separation of food waste in UCT residence kitchens would be relatively straightforward, as a basic separation of wet and dry waste is already occurring.[13] Staff training would be necessary, with close supervision at the beginning of the process. Once a food waste separation system is running efficiently in residence kitchens, it would be worth adding the food waste from the campus cafeterias.

Should the University decide that composting food waste is not a feasible option, food waste could be donated to urban agriculture projects on the Cape Flats, where sandy soils lacking nutrients are a major constraint to plant growth. A partnership could be set up with an organisation such as Abalimi Bezekhaya, which is an urban agriculture association operating in Khayelitsha, Nyanga and surrounding areas on the Cape Flats. Abalimi assists individuals, groups and community based organisations to initiate and maintain permanent organic food growing and nature conservation projects as the basis for sustainable lifestyles, self-help job creation, poverty alleviation and environmental renewal.[14]

Middlebury College Composting[15]

Middlebury College, USA began on-site composting in November 1996. Though monthly numbers vary, composting accounts for roughly a quarter of the College's waste stream. The main reasons for doing so were hopes of realizing greater cost savings, being able to utilize the end product, and a desire to eliminate the excess fossil fuel use involved in shipping our food waste to New York. Food waste at Middlebury College increased from 150 tons in 1993 to over 250 tons in 1997. Materials collected include:

* *Pre-consumer food prep scraps*
* *Post-consumer food waste*
* *Waxed cardboard and boxboard*
* *Paper towels and napkins*
* *Assorted food prep paper waste*

The composting process takes place in Passively Aerated Windrow System (PAWS) in a self-contained compacting roll-off container. This is sealed to prevent leaking of liquids. It is also equipped with an ozone generator to control moisture and moderate odor problems. This has had the added benefit of making the container less interesting to flies and has alleviated much of our previous problems with maggots.

Problems and Solutions: *No problems like pile odour, insect infestation or excessive moisture. The PAWS system is the main reason. By not having to turn the piles, we avoid the addition of extra moisture. It also acts as a filter, preventing excessive odor release as experienced with the turning of windrows.*

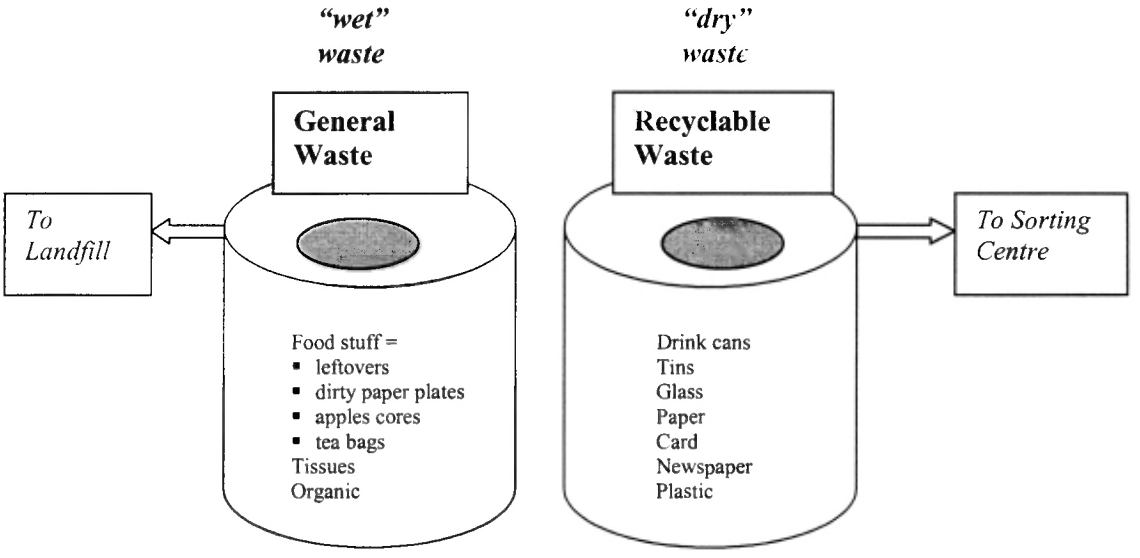
Financial Benefits: *Middlebury College spent about $48,000, as opposed to the estimated $150,000 they would have had to spend to dispose of the material in the landfill. This means an estimated $102,000 of savings since April 1993. Middlebury captures at least 75% of food waste produced on campus.*

Recycling

In "recycling", waste materials (e.g., glass, metal, plastics, and paper) are separated and sent to facilities that can process them into new materials or products. This aspect is covered in more detail in Section 5 Materials Recovery Facility.

One of the most important and visible educational tools in UCT's waste programme, would be separation at source. All rubbish bins at UCT should ideally be replaced with bins which allow separation of waste. We would recommend a two-bin system to sort "wet" from "dry" waste is implemented, rather than a multiple-bin system to sort recyclables into paper, glass, plastics, etc. (See figure 4.3 below) Given past experience at UCT, it is likely that students will not separate their waste conscienciously. Nonetheless, this separation at source is recommended as it raises student awareness about the need to sort waste.

Figure 4.3 Separation into Wet and Dry Waste



4.3 Ranking Options and Feasibility Analysis

The ranking of options and a feasibility analysis can only be done once a full waste audit has been completed. Therefore this step in the Waste Minimisation Programme could not be developed in this study. See Section 1.4 for limitations of this study.

4.4 Planning and Organisation

4.4.1 The need for institutional commitment

A UCT waste minimisation programme should be established through policies and structures created at the central level, but implementation of the programme should be devolved to departments. The main reason for this recommendation is that departments are currently run relatively autonomously, under faculties. Departmental autonomy could prove to be either an opportunity or a constraint, depending on how the autonomy is managed. Also, a waste management programme is easier to implement and monitor in a smaller area, so departments are better able to make real changes than an organization the size of UCT. Some departments have different types and quantities of waste, so a centrally imposed waste minimisation strategy will not be as effective as one which a department was involved in creating.

Departments should be assisted to implement recommended measures – this may involve financial assistance from the university to cover costs of new technology etc.

Staff and student commitment is necessary for waste minimisation to work. As departments at UCT are fairly autonomous, it is important that they *buy in* to the waste minimisation programme, otherwise the

implementation will be patchy. This constraint could best be overcome by involving someone in each department in a Waste Minimisation Club, so that they can act as a 'project champion'.

4.4.2 Waste minimisation clubs – the project team

One or more Waste Minimisation Clubs should be started on campus. The Waste Minimisation Club concept, developed in the Netherlands in the early 1990s to encourage industries to reduce pollution, usually involves a small number of companies, generally within the same geographical area, working together to exchange ideas and information on minimising waste and encouraging each other to improve process efficiency, save money and reduce their environmental impact.[16] The clubs that have been formed in South Africa indicate "that recurrent first year savings of 2% to 7% of turnover can be achieved through a formal programme."[17]

> *The Pollution Research Group at Natal University ran two pilot clubs in KwaZulu Natal – one in the metal finishing sector in Pinetown and Durban, and one in the industrial area of Hammarsdale. R13 million was saved by 20 companies, the majority of which was achieved through improved housekeeping practices at no, or low, cost. On average, savings accounted for between 2% and 5% of the annual turnover of the companies.*[18]

Waste minimisation clubs at UCT should involve key personnel from each department, who will then effectively form the 'project team' to drive the waste minimisation programme.Waste Minimisation Clubs could be run by BECO – the organisation running most of the Cape Town waste minimisation clubs, or a new staff member could be appointed to co-ordinate the clubs.

4.4.3 Overcoming barriers through awareness raising

Awareness raising is seen as a critical success factor, since lack of interest in waste minimisation from students and staff is the main barrier to overcome. Good publicity and awareness raising is vital to stimulate interest in and commitment to the campaign. An education and awareness programme on campus should include the key players in departments (particularly the administrative assistants who do purchasing of stationery and other requirements.)

The main constraint to waste minimisation is that everyone on campus needs to take responsibility for the waste minimisation programme for it to be effective. The top – down approach is useful insofar as the university shows its commitment to more sustainable practices through initiating policies and setting up structures to enable them to be realized. But effective implementation will only happen once staff and students are committed to the changes. For this to happen, a profound change in attitudes must occur – a paradigm shift. One of the aims of the waste minimisation project is to raise awareness and educate students about sustainable living, but bringing about this change of awareness is not going to happen quickly.

The recently imposed national ban on thin plastic bags and free plastic bags for shoppers is usefully timed as it is bringing waste management issues into the spotlight. UCT can take advantage of this prominent issue in launching a waste minimisation campaign on campus. The extensive media coverage of the World Summit on Sustainable Development in Johannesburg last September has also raised popular awareness of sustainability issues.

The waste minimisation strategy could be publicised in many different ways, for example:

- With a presentation given at staff meetings in all departments.
- During induction of new staff members.
- During student orientation week a multimedia display on waste issues in South Africa (preferably designed to shock) should introduce UCT's waste minimisation policy. This should also show practical ways in which students can be a part of the solution to the problem of waste.

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[1] University of Michigan Environmental Task Force Report, 1990. Available online athttp://www.umich.edu/~nppcpub/resources/compendia/PPpdfs/PP06.pdf

[2] Integration of Waste Minimisation programmes put forward by:
- de Hoo, S, H Brezet, M Crul and H Dieleman (eds) (1991) *Manual for the Prevention of Waste and Emissions*

Netherlands Organisation of Technology Assessment. NOTA Publication, Rotterdam
- Common Ground and deVilliers Brownlie Associates (2003) *A Waste Minimisation Guideline Document For Environmental Impact Assessment (EIA) Reviews, for the Dept of Environmental Affairs and Development Planning*
- Environment Agency (2001) *Waste Minimisation Good Practice Guide* available online at http://www.environment-agency.gov.uk/

[3] See Appendices C2 and C3 for further information about previous recycling and waste management initiatives.
[4] See Section 4.2.2.
[5] See Section 3.4 on Current Waste Management at UCT for more information on these issues.
[6] de Hoo, S, H Brezet, M Crul and H Dieleman (eds) (1991) *Manual for the Prevention of Waste and Emissions* Netherlands Organisation of Technology Assessment. NOTA Publication, Rotterdam
[7] Sanitation Connection 2002 *Introduction to Solid Waste Management* available online at http://www.sanicon.net/titles/topicintro.php3?topicId=4
[8] interview with Wayne Tzemis, 23 April 2003
[9] Source: University of Waterloo, website: http://www.adm.uwaterloo.ca/infowast/
[10] See Appendix C5: Waste Minimisation Practice at Other Universities - Brown University
[11] See Appendix C5: Waste Minimisation Practice at Other Universities - Brown University
[12] University of Waterloo, www.adm.uwaterloo.ca/infowast/composting.html
[13] Interview with Ms Ann Chong, Residence Catering Manager, 17 April 2003
[14] Abalimi Bezekhaya website: http://www.abalimi.org.za/
[15] Middlebury College, http://www.middlebury.edu/%7Erecycle/compreport.html
[16] Waddington, Kathy 2002 "Mountains of waste can be shifted" in *Science in Africa*, August 2002. Available online www.scienceinafrica.co.za
[17] Professor Chris Buckley, head of the Pollution Research Group at the University of Natal, quoted in an article in Science in Africa, August 2002. online www.scienceinafrica.co.za
[18] Science in Africa, August 2002. Available online www.scienceinafrica.co.za

5. Scoping Of Site Options For Material Recovery Facility at UCT

This section focuses on the scoping of options for an MRF for UCT. Initially five sites were identified using an aerial photograph of UCT and from discussions with Lillian Campbell and Geoff de Wet of P&S. The sites were then scoped on the basis of certain environmental evaluation criteria, namely vehicle accessibility, visibility, current use, slope, landuse compatibility, heritage and building restrictions, and cost of development relative to other sites. In the preliminary scoping of the five options, two sites were eliminated for reasons given below. The remaining three options were scoped in more detail for their suitability for a MRF.

5.1 Material Recovery Facility

An MRF is a facility at which solid waste is sorted to recover materials for sale. There are advantages and disadvantages to having an MRF. They are summarised in Table 5.1 below.

Table 5.1 Advantages and Disadvantages of Material Recovery Facilities

Advantages	Disadvantages
• Enhances levels of recycling • Saves on waste disposal charges • Reduces demand for landfill and alternative waste management methods • Creates employment • Generates revenue from the sale of recyclable materials • Enhances public image	• Can be difficult to persuade manufacturers or suppliers to use recycled materials • Can use more energy in transporting recyclable materials than is saved in the recycling process • Markets for recycled materials need to be developed • Health, safety and amenity issues need to be addressed • Financial viability can be highly susceptible to market variations and waste output

5.2 On-site versus Off-site Options

The choice of either having an on-site or an off-site MRF has implications or opportunity costs for UCT. These implications are summarised in Table 5.2 below, with the current DWS MRF providing the comparison for an Off-Site option.

UCT's research, educational and economic priorities will determine which costs and benefits are most important. Waste minimisation best practice demands that social, economic and ecological factors be considered in the siting and subsequent operation of the facility. The implications of an MRF to UCT will demand a full, participatory EIA based on a waste audit to be able to quantify and so determine the most viable MRF option, thus ensuring that UCT benefits economically, socially and environmentally.

Table 5.2 Comparison of on-site and off-site options for UCT

If the MRF is On-site at UCT, then...	If the MRF is Off-site, then...
...the facility might become uneconomical if waste reduction activities are successfully implemented.	...the ramifications of an uneconomical facility are borne by the contractor, DWS, and not UCT.
... there is a greater chance of UCT meeting the educational goal of creating awareness and research, but will require staff and student commitment for successful implementation.	...education and research opportunities are foregone, unless a partnership is established through an initiative like PASE.
...there are severe limitations with regard to physical space on campus and compatible land use type that must be addressed.	...provides UCT with options to use the limited available space for other educational related development in the future.

(Continued) If the MRF is On-site at UCT, then…	(Continued) If the MRF is Off-site, then…
…the public and UCT community may raise concerns about health risks, impact of noise, traffic, and incompatibility with land-use type and zoning standards.	…it is out of sight, out of mind: Public attitudes were a factor in the current arrangement of having the waste sorted off-site.
…fluctuations in the market price of recyclables may affect UCT if it is managing the facility itself because it cannot supply bulk quantities like DWS and so demand price stability.	…the effect of market fluctuations on UCT will be lessened because DWS sorts huge volumes of waste.
…UCT can have greater control on what components are separated from the solid waste stream such as organic waste that then may be composted.	…there is a lost opportunity to reclaim organic material for composting as the organic waste is included in general waste and taken to the landfill by DWS.
…the management of the facility would be outsourced, since it would not be not in line with UCT policy of concentrating on 'core business.'	…UCT will not be directly involved in recycling on campus, except possibly through waste separation at the level of separation bins.

5.3 Current Off-site MRF

UCT waste is currently being sorted off-site by DWS at their MRF in Airport Industria.

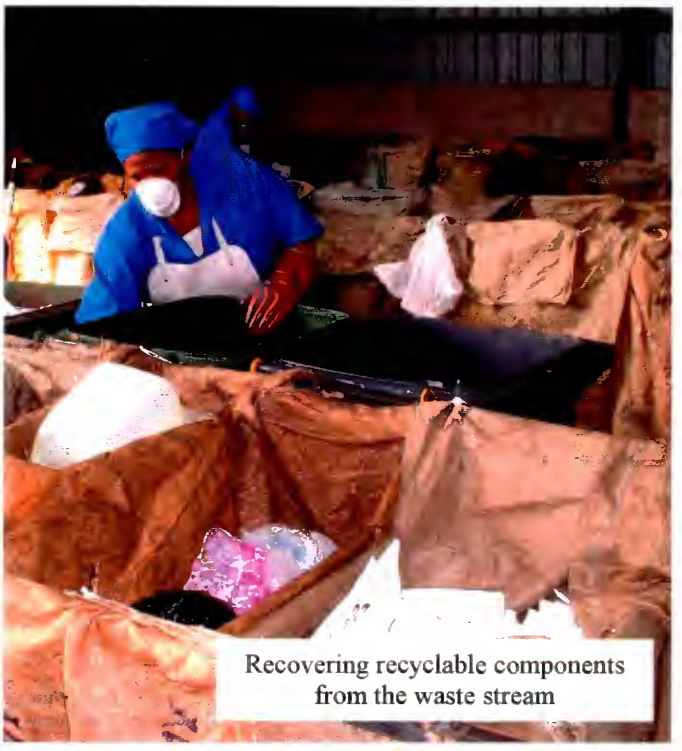
Solid waste is collected from UCT in dumpsters twice a day, and transported to the sorting centre, where it is offloaded and placed into designated UCT Otto bins. The picture below shows the designated area for UCT Otto bins. The bins contain mixed waste yet to be separated into recyclable and non-recyclable components by the sorting staff.

On the far left of the picture is a conveyor belt that carries the non-recyclable waste to a compactor, situated at the rear of the building. Some sorting staff are situated away from the conveyor belt. Their non-recyclable waste remains in the wheelie bins, which are then mechanically lifted into the compactor. There is a picture of this being done on the following page.

The designated UCT area for unsorted waste

UCT Otto bins are sifted through by sorting staff and the contents separated into cardboard, paper, glass, cans, plastic and 'general' waste. There are 40 potential categories, if the main categories are also sorted into different grades. Sorters are paid according to the number of bins sorted daily.

Sorting staff wearing protective clothing, gloves, glasses and mask



Recovering recyclable components from the waste stream

Non-recyclable waste is removed, compacted (picture on right) weighed, and sent to landfill.

The various recyclable components that have been separated, are compacted, weighed and bundled. They are sold to specialist companies that deal in recovered products (e.g. Collect-a-Can) for recycling.

General waste about to be compacted

Recovered cans ready for sale

DWS is in a strong position with the downstream companies because of the sheer bulk that it supplies. They can therefore demand competitive prices and price stability for sorted materials.[1]

DWS ensures good health and safety measures are adhered to at the MRF. The sorting staff use appropriate protective clothing. The MRF also contains correct signage, maintains good hygiene and cleanliness.

5.4 Potential On-site MRF

An on-site MRF has been proposed on a site above the Educare Centre on upper campus, where garden waste is currently being mulched.[2] The UB&DC requested that an EIA of the proposed site be undertaken. It was recognized early on in the project, however, that an EIA of the proposed and alternative MRF sites could, in all likelihood, be flawed, since a reliable solid waste stream baseline could not be established and site requirements could thus not be determined and potential impacts also and scale of operation could not be evaluated. However, it was felt that an initial scoping of potential on-site MRFs could be done.

5.4.1 Evaluation of possible sites for an MRF

Five possible sites were evaluated for a MRF:

Table 5.3 Sites selected for possible MRF

Proposed Site	***Position on UCT Map (Refer to Appendix C1)***
Site 1: The Mulching area	Above block A3/A4
Site 2: The basement of proposed northwards extension of the Sports Centre	Block F 11
Site 3: The lower parking area of the Sports Centre	To right of block F12
Site 4: The foot slope area of the UCT dam	Block E 11
Site 5: The Mound area, above Kopano residence	Block I 5

The above options were generated using the site map of UCT to find open, undeveloped spaces as well as through consulting with key players in UCT property management. All sites are on UCT property. An initial site visit and subsequent discussion with the Physical Planning Unit of P&S on building restrictions revealed that Sites 4 and 5 could be immediately excluded. The remaining three sites were then scoped and are presented in a matrix below.

5.4.2 Exclusion of Sites 4 and 5

A preliminary evaluation was done on the sites selected and two sites namely sites 4 and 5, were immediately excluded for reasons given below:

- Site 4: The foot slope area of the UCT dam

  This site is highly visible from both town and campus. Any development of the site would require cut-and-fill, thus steepening the dam-toe. This is not advisable given its location beneath the dam wall.

- Site 5: The mound area, above Kopano residence

  This site is outside the CCT "Urban Edge" and so at present cannot be developed. Should it become possible for development to take place, the land has been set-aside for residences.[3]

5.4.3 Scoping of Sites 1, 2 and 3

The criteria used to scope sites 1,2 and 3 were as follows:

- Accessibility for vehicles transporting waste and sorted materials, and disruption to traffic flow.
- Potential visibility of the MRF.
- Gradient of the slope.
- Current use of the land.
- Compatibility with surrounding landuse and the potential risk to health and safety.
- Existence of applicable heritage and building restrictions.
- Relative cost of the MRF compared to the other options.

Sites 1, 2 and 3 were scoped in terms of these criteria and presented as a matrix in Table 5.4 below. A colour was assigned to each to indicate the extent to which the project team felt that the implications were considered to be positive or negative.

Table 5.4 Scoping Matrix for Sites 1, 2 and 3

Impact Key:	Colour
Positive	Dark Green
Somewhat Positive	Light Green
Somewhat Negative	Orange
Negative	Red

Sites	Site 1: Mulching Area	Site 2: Sports Centre Extension	Site 3: Lower Sports Parking
Area (see Campus Map)	*above block A3/A4*	*in block F 11*	*to right of block F 12*
Accessibility for Waste Service Vehicles	via upper ring road; Educare Centre, Gardens & Nursery, Tennis courts, Student parking; not central to campus; Hard to negotiate security boom access	via top of Woolsack Drive, by Sports Centre; Sports Centre, student parking; congestion of ring road; outside of boom-control security precinct	via top of Woolsack Drive, by Sports Centre; Sports Centre, student parking; NB. Narrow, winding access roads; avoids congestion of ring road; outside of boom-control security precinct
Visibility	Minimal from town / campus side; design indicates that it would be cut into the slope and the line of the roof would follow the slope profile, thus minimising its visual impact	Incorporated into basement of Sports Centre, with extended sports halls above; only as visible as the Centre itself	Possibly only visible from UCT access road, well screened by vegetation and concave nature of slope.
Current Use	In use for mulching, processing of garden waste	Partially parking space - UCT has a severe shortage of parking space	Parking space - UCT has a severe shortage of parking space
Slope	Require min. cut-and-fill	Already levelled	Already levelled
Landuse Compatibility (Health & Safety Risks, Institutional Demands and Student Requirements)	"brownfield site" has been used as a backyard dumping ground for decades; compatible with already established mulching of garden waste (+ve); possible conflict with Educare Centre and conservation area over "concept" of MRF(-ve)	"brownfield site"; if attached to building it may be perceived as extension rather than separate development (+ve); Compatible with existing sports activities, ie. noise (+ve); possible conflict over loss of parking space & compatibility of waste sorting with recreational demands (-ve); Potential for noise during exam time (-ve); UCT sports clubs also want more space	"brownfield site"; disjunct from all other areas/activities (+ve); possible conflict over loss of parking space (-ve)
Heritage and Building Restrictions	General UCT agreement not to develop above the ring road and more recently, not to build anything more on Upper Campus; depends how the MRF structure is viewed	None; extension of Sports Centre has been spoken about for years.	None.
Cost of Development Relative to other Sites (Based on discussions with Head of Physical Planning Unit, P&S)	LOWEST: low-key, semi-open structure, developed in keeping with the wooded environment.	HIGHEST: extension in keeping with original Sports Centre development, designed for basement use like that of MRF at Canal Walk. Basement area of Sports Centre could be viewed as 'vacant' space arising from the proposed Sports Centre Extension but there would be many competing demands on that space.	MEDIUM: freestanding structure, must be appropriate design for new building.

Site 1: The Mulching Area

The mulching area location has negative implications in terms of accessibility, building restrictions and health & safety. The site is not centrally located, and its location on a small road at the top of campus (inside the security boom area) would make access relatively difficult to heavy vehicles transporting unsorted and sorted waste.

UCT has a policy not to build any further buildings above the Ring Road, and recently a decision was taken not to build further on Upper Campus. Erection of an MRF would be in conflict with both these guiding principles.

The site could present health risks (nuisance values, smells, rats and flies etc) due to its proximity to the Educare centre, however this can be mitigated by good management practices.

Site 2: The basement of the proposed northwards extension of the Sports Centre

This option is more centrally located than Site 1, which would reduce transport costs. It is easily accessible to heavy vehicles and is outside the boom-controlled security area. Some parking places would be lost to create off-loading areas and turning areas for vehicles.

This would be controversial as there is a severe shortage of parking on campus. However, siting a MRF in beneath the Sports Centre building would not be an incompatible land use, except during exams times when the noise could be problematic as the Sports Centre is used as an exam venue. This could be mitigated through design.

Site 3: The lower parking area of the Sports Centre

Like option 2, this option is also centrally located and outside the boom-controlled security area. It is less accessible to heavy vehicles than Site 2. About 50 parking places would be lost in constructing the MRF on the parking lot. This would be controversial as there is a severe shortage of parking on campus. However the Sports Centre parking bays could be densified to increase the number of demarcated parking spaces.

5.5 MRF Conclusions

- Detailed information is needed on the economic costs of the different MRF options.
- There is no guarantee that an On-site MRF will have greater education benefits than an Off-site MRF since its effectiveness will depend on how the University incorporates it into its research and education programmes.
- The volume of solid waste produced by UCT fluctuates throughout the year, especially during student holidays. An On-site MRF may not then consistently optimize its staff and transport.
- UCT has limited physical space on campus for developing buildings. An MRF may not be viewed by the broader UCT community as a priority.
- Public and UCT community perceptions around "waste" may be the greatest challenge to having an on-site MRF at UCT.

5.6 MRF Recommendations

- A waste audit needs to be undertaken to determine the type, quality, and quantity of waste produced by UCT before an EIA is undertaken.
- A full EIA should be undertaken to determine the MRF site option that ensures that the social (political and educational), economic and environmental benefits outweigh the costs to UCT. The EIA should consider *inter alia*:
    - the cost of collecting and transporting materials to the MRF;
    - the broader costs per volume of waste handled in terms of labour costs, transport costs, management time and monitoring costs, and disposal costs.
    - the cost of separating contaminants from recyclables;
    - the market for recovered products;
    - outsourcing options for the management of an MRF
    - long term staff costs;
    - occupational health and safety costs associated with collection and sorting.
    - The long term implications of an effective waste minimisation programme reducing the waste stream.
- Following on from an EIA, a strategy needs to be developed to optimize the research and educational benefits of having access to either on-site or off-site MRF in order to ensure that there is sustained staff and student involvement.
- Any further development of a proposed MRF should involve public participation. Extensive public participation is a standard part of the EIA process.

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[1] Site visit to DWS MRF at Airport Industria, and interview with Mr Jeremy Droyman, Director of Don't Waste Services, 8th April 2003

[2] APPENDIX B.6: UCT Waste Separation Centre, Physical Planning Unit, Properties & Service

[3] Geoff de Wet, interview by group on 23rd May 2003

6. Conclusions

Conclusions are grouped in terms of: institutional responsibility, legal and policy context, cost of waste disposal, waste management practices at UCT, and best practice waste minimisation and its application at UCT.

6.1 Institutional Responsibility

- UCT is one of only five South African universities that is a signatory to the Talloires Declaration, with its related aims and objectives for sustainable campuses.
- UCT, through PASE, is committing itself to promote an ethos of sustainability at UCT to serve as an example for the wider community.
- The responsibility and cost of waste management at UCT is currently borne by P&S. P&S operates at a university-wide, centralised level, and is responsible for the entire UCT campus. However, the generation of most of UCT's solid waste is associated with departmental, residence and canteen activities.

6.2 Legal and Policy Context

- A paradigm shift is occurring in South African law with respect to waste management from a philosophy dealing with waste only after it is generated towards pollution prevention, waste minimization, cross-media integration, and the involvement of all sectors of society in pollution and waste management.
- Based on current and emerging legal principles:
    - UCT must avoid waste, or where it cannot be altogether avoided, must minimise and re-use or recycle where possible and otherwise dispose of the waste in a responsible manner.
    - UCT is responsible for the environmental health and safety consequences of a waste management policy, programme, project, product, process, service or activity throughout its entire life cycle.
    - UCT will be accountable for the management and disposal of its waste and will be penalised appropriately for any transgression.

6.3 Cost of Waste Disposal

- Disposal costs at landfill sites in South Africa have increased by 700% since 1991, while in Cape Town disposal costs increased by 88% in 1999, and are expected to continue to increase sharply as landfill space diminishes: Four out of the six landfill sites that serve Cape Town will close down within the next four years.
- Given the anticipated increasing costs of disposal to landfill, UCT should benefit from a waste minimization programme, because significantly less waste will be sent to landfill through the reduction, reuse and recovery of solid waste from the general waste stream.
- UCT, however, presently pays about R1 million per annum to the City Council whether or not it disposes of its waste at a municipal landfill site. There is thus little financial incentive, at this level, for UCT to minimize solid waste as they will not benefit from a reduced charge.
- UCT currently has a contract with DWS to collect and sort all solid waste. This costs UCT R38,000 per month as a service fee, but UCT recoups at least R5000 per month from the sale of the recovered recyclable materials.

6.4 Waste Management Practices at UCT

- Past waste management initiatives at UCT failed because of:
  - Inadequate financial assessment of the projects which turned out to be too costly for UCT.
  - Absence of a waste policy and appropriate institutional structures to manage the implementation process.
  - Insufficient student awareness and participation.
- It is not possible for UCT to ascertain its inputs because purchases are frequently incorrectly entered into the SAP computer system, resulting in as much as 40% margin of error.
- The DWS web page that displays the separation of solid waste from UCT holds the potential for P&S to monitor outputs from UCT, establish trends and so determine which solid waste stream should be prioritised for a specific intervention. The DWS statistics are however not updated regularly, and are not currently reliable because of unexplained anomalies within their datasets.
- Current waste management practice provides little opportunity for raising the environmental awareness of staff and students. All bins on campus are for general waste, so no separation of waste is required. In the Food Court and Nescafe Coffee Shop waste is simply left on tables by students for a cleaner to clear away. Thus students gain no sense of responsibility for their waste.
- Almost half of the departments interviewed recycle paper, either through departmental initiatives or personally by cleaners. This accounts for the significant reduction in paper collected by UCT as opposed to Natal University. Ironically, DWS has asked P & S to intervene as their profits are affected.
- Many departments are storing broken computers and other machinery and electronic equipment as they are unsure how to dispose of them. ICTS has a policy for dealing with out-of-date computers, but departments seem unaware of it.
- There is little incentive for departments to regularly update their computers as the cost of servicing and repairing old machines is borne by ICTS, whereas replacement costs are borne by departments. Thus computers are often unsaleable when they become unusable at UCT, and so add to the waste burden. ICTS would like departments to buy into a 5-year replacement cycle for computers.
- It is premature to plan to build an MRF on UCT property because of insufficient reliable quantitative information on which to base the decision.

6.5 Best Practice Waste Minimisation, and its Application at UCT

Waste minimisation aims to reduce the amount of waste sent to landfill sites. Best practice is to tackle causes and sources of waste, in order to reduce the quantity of waste generated at source, or re-use 'waste' materials. For waste which is unpreventable, recovery through recycling and composting is preferable to disposal. In the UCT context, waste minimization poses a number of challenges with respect to an appropriate programme, policy and institutional structures, in order to tackle the key wastes, and enable optimum reduction, reuse and recovery.

- *Programme:* A waste minimization programme at UCT must recognise that the problems of a research and educational institution are different from that of industries. Management structures of universities do not lend themselves to the more centralized decision-making found in industries. While decentralisation facilitates academic independence, a decentralised approach poses obstacles to the complete tracking of the inputs and outputs of the system.
- Departmental autonomy could be either an opportunity or a constraint at UCT, depending on how the autonomy is managed. A waste management programme is easier to implement and monitor in a smaller area, so departments are better able to make real changes than a large organisation the size of UCT.
- *Policy & Structures*: Appropriate policies and support structures to promote waste minimisation are needed at a central level since these form the basic structure on which a waste minimisation

programme rests. Their absence was a key reason for the failure of previous waste minimisation initiatives at UCT.

- *Waste Streams:* Paper and food waste are the largest categories of solid waste that would be targeted by a waste minimisation programme at UCT.
- *Reduction:* The ideal option is to prevent solid waste being generated by UCT activities: Source reduction means greater efficiency because processes are streamlined so that fewer inputs and materials are necessary, thus saving on purchasing costs.
- *Re-use:* In re-use, an item is used for the same purpose again. UCT presently reuses its furniture, office equipment and computers wherever possible.
- *Recovery:* In recovery, materials that can be reprocessed and put to other beneficial uses are separated from general waste that goes to landfill. UCT currently keeps garden waste and mulches it for use on campus gardens. UCT also currently recovers recyclable materials from its general solid waste through DWS service.

7. Key Recommendations and Actions

This section firstly gives the key recommendations for UCT to develop and implement a waste minimisation programme, then gives more detailed actions in Table 7.1 below, that can be undertaken in different time-horizons. The recommendations in Table 7.1 relate to policy, institutional arrangements, awareness-raising, and waste minimisation actions. The recommendations have been prioritised according to those actions that can be undertaken in the short-term (now), medium term (<2 years) and long term (>2 years). Many of the medium to long term actions are dependant on other actions taking place and thus can only take place at a later stage. The key recommendations from this study are as follows:

7.1 UCT Policy

Waste minimization initiatives are likely to fail if they are initiated in a policy vacuum. It is thus essential that the UCT Draft Environmental Policy is accepted and informs the development of all other related policies, including a Waste Minimisation Policy and Purchasing Policy.

UCT currently has a Waste Management Plan at draft however this has limitations and should rather be reformulated into a Waste Minimisation Policy, based on this study.

The policy to promote waste minimization, and the necessary structures to support it must be agreed to and supported at the highest level of the university, since this will give credence to the initiatives that follow and increase the likelihood of its sustainability. Thus a waste minimisation programme at UCT must incorporate the entire organisational hierarchy of the campus, starting with upper administration down to the student level.

Formalise the UCT Environmental Policy.

Develop a UCT Waste Minimisation Policy as well as a Purchasing Policy based on this study.

7.2 Waste Audit

A sound waste minimisation programme relies on reliable information on the waste stream. Given shortcomings in information on UCT's waste, a university-wide waste audit should be conducted as a matter of urgency. A number of possible actions, such as the siting of an MRF on or off campus, are dependent on the outcomes of an audit.

The waste audit must identify and quantify the waste streams generated at UCT and the areas they are coming from. The waste audit would be useful in setting up a Waste Minimisation Club and providing incentives for departments to minimise waste. There is a logical link here with the development of an EMS at UCT which will also require audits of other waste streams.

Commission a Waste Audit as part of the continued development of an EMS and use the results to determine the economic feasibility of an MRF.

7.3 Waste Minimisation Club

One or several Waste Minimisation Clubs should be started at UCT since this provides a forum to integrate the operations of centralised P&S, administration and autonomous departments. Also, such Clubs would enable the formulation of financial incentives to minimise waste.

The waste minimisation club should involve key personnel from each department, who then would effectively form the team to drive the waste minimisation programme at UCT. The Administrative Assistant who controls departmental purchasing or the Building Supervisor are suggested as the staff members who should represent each department in the Waste Minimisation Club.

Waste Minimisation Clubs could be run by Institute for Sustainable Business (BECO), the organisation running most of the Cape Town waste minimisation clubs, or a new staff member could be appointed to co-ordinate the clubs. If the former is agreed to, then P&S could enter into dialogue with BECO about

implementing a Waste Minimisation Club and work towards its implementation at UCT. This would have to be taken to the Environmental Management Working Group (EMWG) and from there, to the broader university community for acceptance.

Start a waste minimisation club at UCT to integrate the operations of centralised P&S, administration and autonomous departments, and promote the continued improvement of UCT waste minimisation.

7.4 Materials Recovery Facility

Building a Materials Recovery Facility on campus is not recommended, until detailed studies have been done, particularly a cost-benefit analysis. Specific information that is needed includes:

1. Accurate information from a **waste audit** about the type, quality, and quantity of wastes produced by UCT. Information is also needed about the quantities of marketable materials produced, as these determine the type and size of MRF to be built. These factors will influence the running of both the capital and running costs of a facility.

2. **Cost implications**: Economic viability is a key issue in deciding whether to build an on-site MRF as well as where to build it. The economic considerations include amongst other things:

   - the cost of collecting and transporting materials to the MRF;
   - the cost of separating contaminants from recyclables;
   - whether there is a market for the recovered products;
   - staff costs;
   - occupational health and safety costs associated with collection and sorting.

   Therefore a sound cost- benefit analysis is needed, to ensure benefits outweigh costs to UCT especially if waste reduction activities occur within departments and at cafeterias.

3. **Stakeholders** in UCT and the surrounding community should be consulted. Public participation is a standard part of the EIA process, so this would be done if a full EIA is carried out.

While outsourcing of services to run the MRF might be suitable for UCT and in line with the policy of 'core business', the option however can only be adopted or pursued if it contributes to costs saving / or raising revenue to UCT. This further calls for detailed assessment of costs associated with options to be taken.

Given the uncertainty about the viability of an on-site MRF, and the fact that more detailed studies need to be done, it is not possible to make a concrete recommendation about the best site for an on-site MRF.

Building an on-site MRF is not recommended without further studies and cost-benefit analysis.

Table 7.1 Recommendations

	Short term	Medium term (<2 years)	Long term (>2 years)
Policy	• Approve the Environmental Policy. • Develop a Waste Minimisation Policy, based on the findings of this study.	• Develop a Purchasing Policy that governs *inter alia* the purchasing of recycled goods, durable goods that can be repaired if broken, printers/photocopiers that are capable of duplex printing and reduction, and return-of-packaging to suppliers.	• Review policies and undertake any necessary changes.
Institutional arrangements	• Enter into dialogue with BECO about implementing a Waste Minimisation Club at UCT. • Develop a list of relevant names and telephone numbers to do with waste minimisation queries and circulate to all departments.	• Implement a UCT **Waste Minimisation Club**. • Develop institutional structures to support a waste minimisation programme. • Allocate clear responsibilities for dealing with waste issues that includes the role of individual departments and the EMWG. • Devolve the practical implementation of waste minimization to departments, as they are autonomous. • Seek to provide departments with financial incentives to minimise solid waste. • Co-opt one person within each department to be the point-person who is answerable for waste minimisation within the department. • Negotiate contracts with canteens that ban the use of materials such as polystyrene.	• Ensure that institutional structures can stand alone despite staff changes – departure of 'champions' and sabbaticals of senior staff.
Raising Awareness	• Make preparations to provide information booklets to 1st year students at orientation on UCT's environmental ethic, commitment to sustainability and how and what to recycle. • Maintain dialogue with Earthlife Africa to promote the waste minimisation agenda among students on campus. • Inform Supercare cleaners not to mix already separated waste.	• At staff inductions train new employees on waste minimization and recycling. • Present waste minimisation strategy and progress at Departmental meetings. • Place recycling bins on campus, with uniform colours and catchy labels, to raise the awareness level of recycling on campus. • Place posters on waste minimization in canteen areas and other student nodes. • Distribute information sheets in offices on what to recycle, where to recycle and who to contact when in doubt. • Establish a waste minimisation link on UCT's website that gives waste reduction tips, helps to raise the awareness of students and staffs towards waste minimization. • Train staff and students on how to use duplex and reduction features of printers and photocopiers, through posters in printer rooms, and by putting information on the ICTS website. • Include in the Monday Paper and UCT website a "waste barometer", showing weekly changes on waste production.	• Develop through PASE, research and courses relating to waste minimisation. • Develop incentives to reward those who achieve the most significant reduction in waste streams, e.g. inter-departmental and inter-residence competitions.

Waste Minimization / Action	• Remove derelict signs around campus from previous recycling initiatives. • Obtain provisional data on inputs from Procurement Services to guide a waste audit. • Ask for more reliable figures of UCT's waste and a further breakdown of the general waste from DWS.	• Commission a detailed **waste audit** of UCT. • Based on the waste audit, allocate waste disposal costs to department so that those responsible for generating the waste have a financial incentive to minimise. • Introduce refillable mugs on campus to reduce the production of paper and polystyrene cup waste. • In co-operation with the canteens, investigate the viability of returnable bottles instead of cans and disposable cups, and reusable plates and utensils instead. • Implement a two-bin (#1. Recyclable, #2. Non-recyclable) recycling system or at most 3-bin system (#1. Paper, #2. Cans, Glass, Plastic, #3. Non-recyclables), which has been shown by other universities to be the most simple and easiest system for students to use. • Negotiate with canteens and residence kitchens to separate out food waste and form partnerships with community initiatives that compost waste. • Explore opportunities of linking UCT's re-usable or recyclable waste with the Integrated Waste Exchange (IWEX) of the City of Cape Town. • Encourage staff and students to re-use paper printed on one side. • Provide departments with a list of ways to deal with unusual waste. This should include places in Cape Town that reuse or recycle specific things. • Insist that all departments set up access to printers through a print counter so that there is individual billing of print-outs. This provides a financial incentive to minimise.	• Develop monitoring and evaluation programmes to ensure that the Waste Minimisation programme is continuously improved. • Document progress, and develop linkages with other universities to exchange lessons learned.

APPENDICES

Appendix A1: Project Proposal
Solid Waste Management: Developing a Waste Minimisation Programme for the University of Cape Town

Project Proposal
March 2003

MPhil (Environmental Management) Student group
Environmental Evaluation Unit
DeVilliers Brownlie & Associates

UNIVERSITY OF CAPE TOWN

INTRODUCTION

The University of Cape Town (UCT) has committed itself to working towards sustainable development, through the signing of the Talloires Declaration in 1990 and the alliance with the Association of University Leaders for a Sustainable Future (ULSF). As a signatory to the 1990 Talloires Declaration, UCT has agreed to, *inter alia*:

- Set an example of environmental responsibility by establishing institutional ecology policies and practices of resource conservation, recycling, waste reduction, and environmentally sound operations.
- Engage in education, research, policy formation, and information exchange on population, environment, and development to move towards sustainability.

After a long period of inactivity, Vice-Chancellor Ndebele recommitted UCT in 2000 to the implementation of sustainability concerns. The subsequent formation of the Environmental Management Working Group (EMWG), appointment of an Environmental Officer and drafting of an Environmental Policy bears further testimony to this renewed commitment.

The scale of UCT's environmental impact is proportional to the size of its staff and student body, spatial extent and activities. The university has a student population of approximately 19,000 and a staff complement of 4,500. The student population is growing at an average rate of 5 percent per annum. The UCT footprint extends over a number of non-contiguous campuses in urban and suburban areas. A major by-product of UCT is solid waste, with it generating an estimated 10.53 tonnes of solid waste per day.

At a broader level, solid waste management for the City of Cape Town (CCT) is facing a critical period at this time, because:

- Almost 1 million tons of solid waste per annum is transferred to landfill sites from the CCT.
- There are seven operating wastes landfill sites in the CCT: six operated by the council, one privately owned by Enviroserv and Wasteman.
- The lifespan of existing landfill sites is estimated to be in the range of 2 to 30 years, with four of the landfill sites (which include the private landfill) to be closed by the year 2005 if the CCT continues at current rates of solid waste production.
- There are 37 known closed waste landfill sites throughout CCT
- The current cost of maintaining landfill sites as per Department of Environmental Affairs and Tourism policy, is between R30 and R100 per tonne of waste per year.

The Mission of the University of Cape Town is *"to be an outstanding teaching and research university, educating for life and addressing the challenges facing our society... Addressing the challenges facing our society means that we must come to terms with our past, be cognisant of the present, and plan for the future."* The looming waste crisis facing the CCT is one of the "challenges facing our society". UCT should therefore consider its role and appropriate response to this challenge.

AIM

Investigate principles of waste minimisation and how these principles can be applied at UCT. Assess the management of solid waste at UCT, and recommend appropriate strategies that optimise cost, educational benefits and environmental best practice, within the framework of existing and emerging relevant legislation.

SCOPE OF STUDY

Solid waste management entails the reduction, reuse, recycling, treatment and disposal of, *inter alia*, paper, card, glass, tins, food waste, polystyrene. The client has specified that for the purpose of this study, solid waste excludes all toxic, chemical, hazardous and medical waste as UCT has a separate policy for hazardous and medical waste.
This project will focus on management options for the solid waste generated by the university institutions and activities in the Mowbray to Rondebosch sections of the UCT campus, namely upper, middle and lower campuses, including the residences and the Baxter Theatre.

OBJECTIVES

The project objectives are:

1. Investigate principles of waste/wastage minimisation and how these principles can be applied at UCT.
2. To survey the current solid waste management practices within the study area.
3. To review the relevant present and emerging legislation in order to establish compliance with current legislation and implications of future legislation.
4. To assess solid waste management options for UCT that:
    a. are cost-effective,
    b. have educational benefits, and
    c. are in accordance with international and South African solid waste best practice.
5. To produce a report that incorporates the above components and includes a recommendation of the preferred strategy for the management of solid waste at UCT.

TASKS

The project will include the following tasks:

- Study principles of waste minimisation and management.
- Review relevant policies, laws, plans and strategies on waste management at national level, in the Western Cape, in the CCT and at UCT.
- Ascertain waste management practices of the other universities in South Africa.
- Talk to CCT Department of Waste Management, Wasteman, Enviroserv and other waste management services.
- Investigate best practice in overseas universities.
- Examine case studies of best practice in Cape Town, including Century City and Wasteman Services site in Airport Industria Complex.
- Evaluate cost effectiveness of different reduction, reuse and recycling strategies.
- Consider possible sites for a waste sorting centre.
- Consider the education potential of different options.
- Two workshops to integrate information.

PROJECT TEAM

Project Manager
Lynette Kruger, assisted by Tony Barbour, Environmental Management Unit

External Reviewer
Susie Brownlie, deVilliers Brownlie & Associates

Masters Group Members
Members of the group are currently final year MPhil in Environmental Management students of the Department of Environmental and Geographical Science at the University of Cape Town.

- **Yonathan Abraha**
  BSc (Marine Biology and Fisheries), University of Asmara, Eritrea. Worked as a biologist at Seawater Farms, Eritrea and as an assistant lecturer in Marine Biology at the University of Asmara.
- **Peter Houston**
  BSc Hons (Environmental Hydrology), University of Natal. Worked as a research officer for Partners in Development, an engineering firm involved in water supply and sanitation.
- **Margaret Matthew**
  BSocSci (Psychology), University of Cape Town. Microsoft Certified Software Engineer. Most recently worked as an IT technical trainer and consultant in Scotland and England.
- **Muyumbwa Ndiyoi**
  BSc (Natural Resource Management), University of Zambia. Works as a conservation assistant with the Institution of National Heritage Commission, Zambia.

BUDGET: Assessment of Solid Waste Management at the University of Cape Town

Allocations	Unit	No.	Rate	Cost	Total
1. Staff					
Project Manager					
Lynette Kruger					
consultations	13 weeks x 3 hours / wk	39	220.00	8,580.00	
Reading draft reports	hours	25	220.00	5,500.00	
Workshops	2 x 3 hours	6	220.00	1,320.00	
Subtotal		**70**			**15,400.00**
Tony Barbour					
Consultations		4	275.00	1,100.00	
Workshops	2 x 3 hours	6	275.00	1,650.00	
Subtotal		**10**			**2,750.00**
External Reviewer					
Susie Brownlie					
Consultations		10	375.00	3,750.00	
Workshops	2 x 3 hours	6	375.00	2,250.00	
Review of first and final drafts		8	375.00	3,000.00	
Subtotal		**24**			**9,000.00**
Team					
Yonathan Abraha	13 weeks x 34 hours	442			
Peter Houston		442			
Margaret Matthew		442			
Muyumbwa Ndiyoi		442			
		1768			**0**
Subtotal					**27,150.00**
2. Administrative costs					
Travel costs					
Visits to CCT, Stellenbosch Univ, UWC, Wasteman, Canal Walk		250	1.50	375.00	**375.00**
Printing and Photocopying					
Estimate (based on previous projects)				3,500.00	**3,500.00**
Administration					
Telephone, fax, email				200.00	**200.00**
Subtotal					**4,075.00**
Subtotal					**R 31,225.00**
Contingency (5%)					**1561.25**
Subtotal					**32,786.25**
VAT (14%)					**4,590.08**
Total					**R 37,376.33**

ASSESSMENT OF SOLID WASTE MANAGEMENT AT THE UNIVERSITY OF CAPE TOWN

Week Ending:	14-Mar	21-Mar	28-Mar	04-Apr	11-Apr	18-Apr	25-Apr	02-May	09-May	16-May	23-May	30-May	06-Jun	13-Jun	20-Jun	27-Jun
Project definition, proposal and budget																
Literature Review																
Baseline Information:																
Review of relevant legislation																
Assessment of current UCT waste practice																
Workshop1: To discuss baseline info & plan further studies						16-Apr										
Key further study areas:																
Waste minimisation best practice: general philosophy & campuses / universities																
Analyses of cost - benefits																
Principles of environmental education																
Other areas identified at Wks1																
Workshop 2: assimilation & integration of studies										16-May						
Synthesise information and write report																
Draft one												26-May				
Draft two														13-Jun		
Final draft															20-Jun	
Submit report																27-Jun

Appendix A2: Letter of Appointment

UNIVERSITY OF CAPE TOWN

PROPERTIES & SERVICES
2nd Floor Shell Court, Main Road, Mowbray
University of Cape Town, Private Bag Rondebosch, 7701
Telephone: (021) 650-3592 Fax: (021) 689-8078
Website: http://www.uct.ac.za

MEMORANDUM

TO : **LYNETTE KRUGER and SUSIE BROWNLIE**

COPY TO : **Geoff de Wet, Lillian Campbell, Enda Mcguire**

FROM :

DATE : **24 JUNE 2003**

SUBJECT : **Developing a Waste Minimisation Programme for UCT**

Dear Lynette and Susie,

I refer to the project proposal dated 14 March 2003 and to our meeting with your team members, Yonathan Abraha, Peter Houston, Muyumbwa Ndiyoi and Margaret Matthew on 20 March 2003.

I confirm your appointments as Environmental Evaluation Unit (EEU) supervisor and external reviewer, respectively, in terms of the scope outlined in the project proposal.

The prepared budget is in order and I will arrange for the journal voucher to be processed.

Thank you for managing this process.

Yours faithfully

JOHN CRITIEN
EXECUTIVE DIRECTOR
PROPERTIES AND SERVICES

Appendix B1: UCT Mission Statement

Our mission is to be an outstanding teaching and research university, educating for life and addressing the challenges facing our society.

Educating for life means that our educational process must provide:

- a foundation of skills, knowledge and versatility that will last a life-time, despite a changing environment;
- research-based teaching and learning;
- critical enquiry in the form of the search for new knowledge and better understanding; and
- an active developmental role in our cultural, economic, political, scientific and social environment.

Addressing the challenges facing our society means that we must come to terms with our past, be cognisant of the present, and plan for the future.

In this, it is central to our mission that we:

- recognise our location in Africa and our historical context;
- claim our place in the international community of scholars;
- strive to transcend the legacy of apartheid in South Africa and to overcome all forms of gender and other oppressive discrimination;
- be flexible on access, active in redress, and rigorous on success;
- promote equal opportunity and the full development of human potential;
- strive for inter-disciplinary and inter-institutional collaboration and synergy; and value and promote the contribution that all our members make to realising our mission.

To equip people with life-long skills we must and will:

- promote the love of learning, the skill of solving problems, and the spirit of critical enquiry and research; and
- take excellence as the bench-mark for all we do.

We are committed to academic freedom, critical scholarship, rational and creative thought, and free enquiry. It is part of our mission to ensure that these ideals live; this necessarily requires a dynamic process of finding the balance between freedom and responsibility, rights and obligations, autonomy and accountability, transparency and efficiency, and permanence and transience; and of doing this through consultation and debate.

This Mission Statement was formulated by a Working Group of the University Transformation Forum and was affirmed and adopted at a University Assembly on April 24, 1996

Appendix B2: *Draft* UCT Environmental Policy

REVISED DRAFT

THE UNIVERSITY OF CAPE TOWN ENVIRONMENT AND SUSTAINABLE DEVELOPMENT POLICY

PREAMBLE

In 1990 former vice–chancellor, Dr Stuart Saunders signed the Talloires declaration on Sustainable development commitment on behalf of the University of Cape Town. This declaration was initiated by university leaders from all over the world who had become concerned with the "-unprecedented scale and speed of environmental pollution and degradation and the depletion of natural resources".

In 2002 the Vice-Chancellor, Professor Njabulo Ndebele, recommitted the university to the Talloires Declaration. As a signatory, the University of Cape Town agrees *inter alia* to:

- Create programs to develop the capability of university academics to teach environmental literacy to all undergraduate, graduate and professional students.
- Set an example of environmental responsibility by establishing institutional environmental policies and practices of resource conservation, recycling, waste reduction, and environmentally sound operations.
- Utilise university academics and administrators together with environmental practitioners to develop curricula, research initiatives, operational systems, and outreach activities to support an environmentally sustainable future.
- Establish a secretariat and a steering committee to continue this momentum, and to inform and support each other's efforts in carrying out this declaration.

* The Talloires Declaration 1990.

POLICY STATEMENT

The University of Cape Town is committed to being a positive and creative force in the protection and enhancement of the environment through its teaching, research, administration and operational activities.

The University of Cape Town will actively pursue a policy of environmental best practise aimed at achieving sustainable development and will continually strive for improvement.

To give effect to this policy statement the University will take all reasonable steps to meet the following objectives.

EDUCATION

The University of Cape Town will:

- Increase awareness of environmental issues amongst students, irrespective of their field of study, through the incorporation into courses of material on the environment and sustainable development.
- Promote research programmes aimed at achieving environmental responsibility and sustainable development as part of the University's central mission.
- Support the networking and interdisciplinary processing of environmentally relevant issues in research and teaching at the university, also in co-operation with other institutions.
- Encourage and provide education on environmental issues to University employees, so that they can pursue their work in an environmentally responsible way.

OPERATIONS

With regards to achieving improvements in environmental performance related to institutional practice, the University of Cape Town will:

- Adopt ways to minimise energy use and reduce water consumption in all the university's facilities, thus using these resources more effectively and efficiently.
- Develop an effective waste management policy, which will minimise waste in the following order of priority, reduce, re-use, and recycle.
- Develop design policy for all new buildings and refurbishments that will promote water and energy efficiency, reduce any adverse environmental impacts the buildings may cause, whilst developing a productive and healthy environment for work, studies and leisure.
- Avoid the unnecessary use of hazardous materials and take all reasonable steps to prevent damage to either public or ecological health where such materials are used.
- Monitor, manage and minimise polluting effluents and emissions into air, land and water.
- Recognise its obligations through the health and safety policy, to take all reasonable precautions to provide and maintain an environment that is safe and without risks to health for employees, students and visitors.
- Manage and protect the University's natural environment in a sustainable manner, and enhance the environmental quality of the estate to reflect the unique character of the Cape flora and fauna.
- Establish an integrated transport policy, which will provide improved facilities for disabled people and reduce the environmental impact associated with transport to and from the University by encouraging the use of public transport, cycling and walking.

COMMUNICATION

- Use the University's academic expertise and influence to promote its own achievements on environmental issues and to encourage others to do like wise.
- Develop links with the surrounding community and other similar institutions in the context of local sustainable development.
- Keep all staff and students informed of the University's environmental and sustainable development initiatives.

Appendix B3: Draft UCT Waste Management Plan

PREFACE TO THE WASTE MANAGEMENT PLAN by P&S

OVERVIEW OF THE UNIVERSITY OF CAPE TOWN

The Environmental Management Working Group in response to the Talloires Declaration and the Governments National pollution and Waste Management Policy in the process of developing the University of Cape Town Waste Management Plan.

The Plan's objective is to provide for effective and efficient waste management on the Campus, which has regard to environmental and economic costs and benefits, which ensures that the management of waste does not cause a nuisance or is injurious to health.

The EMWG principle aims of the plan is for a **60% reduction** in the amount of waste disposed of to landfills from The University properties in a practical time frame as can reasonably be achieved.

The EMWG now emphasises a change in thinking by prioritising the need for University faculties, through waste management plans, to reduce/avoid waste – which is a significant change from simply requiring the waste disposal contractor to be responsible for collection and disposal of waste on behalf of the University.

IMPACT OF WASTE DISPOSAL ON THE ENVIRONMENT

LANDFILL SITES:

The major environmental concerns associated with landfill sites relate to the formation of:

- Leachates, which are, contaminated water sources from waste disposal sites.
- Landfill gas. These are a mixture of "greenhouse" gases produced when waste decomposes.
- And the use of land, which could otherwise be used for the purpose of agriculture, housing or other much needed facilities and wildlife habitat.

Hazardous and Solid Waste incinerators, if not properly controlled can emit heavy metals such as lead and mercury, dioxins and furans into the atmosphere as well as harmful organic chemicals that contribute to acid rain. The ashes left over after incineration may be contaminated with toxic organic chemicals.

WASTE DISPOSAL FACILITIES IN THE CAPE METROPOLITAN AREA

SOLID WASTE:

The Cape metropolitan council integrated waste management report states that there are:

- 37 known closed waste landfill sites throughout the CMA.
- 7 operating wastes landfill sites in the CMA. 6 operated by the council, 1 privately owned by Enviroserv and Wasteman.
- 4 of the landfill sites (including the private landfill) will be closed by the year 2005 if CMA continues to produce the same amount of solid waste. The lifespan of existing landfill sites is estimated to be in the range of 2 to 30 years.
- Almost 1 million tons per annum of solid waste is received in landfill sites in the CMA.
- The current cost of maintaining landfill sites as per Department of Environmental affairs and tourism policy, is between R30-R100 per tonne of waste.

HAZARDOUS AND HOSPITAL WASTE:

In the Cape metropolitan council area there are:

- 2 hazardous waste disposal sites. These hazardous waste landfills and incinerators are located at Visserhok.

- These facilities have lifespan up to the year 2010 and 2027 respectively.
- 2 medical waste incinerators, one is located at Visserhok and the other at Delft.
- The facilities have a capacity to burn approximately 1920 tonnes of waste per annum and currently receive 1200 tonnes/annum.
- Radioactive waste is stored in Koeberg. There is currently a concern that storage space is running out.

The Department of Environmental Affairs and Tourism White paper on Integrated Pollution and Waste Management for South Africa states:

Any institution which generates hazardous waste and which decides not to manage its waste, is always accountable for the management and disposal of this waste.

WASTE MANAGEMENT PLAN COST BENEFITS

Waste collection costs do not always reflect the full costs of waste management. The full costs of waste disposal facilities include costs of planning, siting, and mitigating environmental impacts and for landfills, closing and monitoring the landfill once full. In many municipalities, these costs are not factored into current waste collection and disposal costs.

COLLECTION COSTS:

Waste collection costs vary for different regions. In the Cape metropolitan area has a flat rate for the collection of waste per litre. This rate is charged every quarterly.

DISPOSAL AND LANDFILL COSTS:

Landfills are expensive to operate because of guidelines set in the Environmental Protection Act of South Africa.

At present there are six operating "general waste" landfill sites in the Cape Metropolitan Council.

A fee is charged for dumping solid and hazardous waste at the municipal landfills if it is a private contractor or someone else's garbage other than the people paying for council collection and disposal service. The CMC charges R 61.73 per Ton waste delivered to registered landfill sites for non-account holders.

For account holders, usually private waste disposal contractors are charged R 70.98 per Ton of waste dumped. According to the private waste disposal contractor working for UCT, approximately an average of 10.53 tonnes of solid disposable waste is generated per day. This excludes garden waste, which is composted on upper campus, and paper/cardboard, glass, which are recycled.

Therefore it would cost UCT 10.53x R 70.98 = R 747.42 per day to use registered sites.

The total cost to UCT should be approximately R 16,443.24 per month to dispose of solid waste at registered municipal landfill sites.

However the private waste disposal contractor working for UCT own a landfill site in Vissershok so therefore they are landfill charges.

It is against the law to dump waste on unregistered landfill sites.

The main aim of the waste management plan is to reduce the amount of waste disposed of to landfills by 60%; this would reduce the landfill cost to R 6574.17 (a saving of R 9869.07 per month).

KEY PRINCIPLES OF THE SOLID WASTE MANAGEMENT PLAN

The Waste Management Plan's aim is to facilitate appropriate waste services that are convenient, adequate and sufficient to provide and maintain public health and divert waste from landfill in accordance with the 60% reduction target.

Options to reduce waste are ranked in a "hierarchy". The most obvious approach is to avoid creating waste in the first place.

The hierarchy is defined as follows in order of priority.

- **Reduction** : lessening/avoiding waste generation
- **Re-use** : further use of product in their existing form
- **Recycle** : reprocessing of waste materials to produce new products
- **Recovery** : extraction of materials from waste for further use or processing e.g. compost
- **Treatment:** subjecting the waste to some sort of process to change the volume/character of waste so that it may be disposed of with reduced effect on the environment.

And as a final option

- **Disposal** : final deposit of waste on land set apart for the purpose.

KEY POINTS OF THE SOLID WASTE MANAGEMENT POLICY

The Waste Management Plan document will set out The University of Cape Town's waste management goals. In order to achieve these goals, the must be an approach that is integrated, with a wide scope or content.

The key points are as follows:

Reduction:

The University of Cape Town Will:

- Set a target to reduce waste generated by the Faculties, Offices, Residence's and other facilities belonging to the University by 60% by the year (to be decided by EMWG). Each department will be given a target to work toward depending on the amount and type of waste that is generated from the department.
- Encourage the use of non- hazardous alternatives to help reduce hazardous waste.
- Promote waste minimisation and specific waste reduction programmes to all departments.

Re-use/ Recycle:

The university of Cape Town will:

- Encourage and promote the re-use of most items such as paper, cardboard etc. for example each department will be asked to set their photocopy machines on double side copy system (less paper is used therefore less paper in the waste stream). Cardboard packaging can be diverted to the Department of Architecture for the students to use for model making.
- Investigate and run trials for campus recyclables collection in a designated area. For example on campus bottle banks, cans collector bins, plastic banks and paper banks.
- Work with existing collectors to promote greater recyclable collection. For example Sappi, paper recycling company, etc.
- Work with others to sustain existing recyclable markets and explore the possibility of the university creating its own market for recyclables.

Recovery:

The University of Cape Town will:

- Investigate options for the recovery, diversion and processing of kitchen (food) waste. For example re-introduce swill for livestock farmers, and divert food that has passed their sale by date to charitable soup kitchens such as WARMTH, and Haven Night Shelter.
- Work to sustain the existing on campus composting of non-hazardous biodegradable waste, such as garden waste and food waste that cannot be diverted.

Disposal:

The University of Cape Town Will:

- Ensure that adequate and environmentally responsible systems are used for the final disposal of residual waste to landfill.
- Ensure that all hazardous waste will be disposed of in an acceptable and safe manner, which would not cause harm to the environment and its habitants.

OBJECTIVES OF THE WASTE PLAN

- To minimise the quantity of the final disposal of waste by facilitating observance of the waste management hierarchy.
- To achieve equity in responsibility for minimising and managing waste.
- To achieve efficient re-sourcing of waste service planning and delivery.
- To eventually integrate The University of Cape Town's waste planning and services with the Cape Towns City councils service planning and delivery, to ensure efficient and cost effective scale to bring about environmentally responsible waste minimisation and management plan in accordance with the principles of ecologically sustainable development, Cape province waste policy and the integrated Pollution and Waste Management for South Africa.

E.M.W.G. COMMITMENT TO THE WASTE PLAN

- The E.M.W.G. will take all reasonable and practical actions within its control to facilitate the achievement of the adopted 60% waste reduction target by a practical time frame as can reasonably be achieved.
- The E.M.W.G. will subscribe to the principles of the waste hierarchy, waste avoidance and minimisation.
- The E.M.W.G. will pursue the reduction of waste within the University's parameters of control in the most appropriate sustainable way and time frame.
- The E.M.W.G. Will adopt the duty of care principal with regards to the management and disposal of hazardous waste as laid out in the Pollution and Waste Management paper for South Africa.
- The achievement of the waste reduction goal will involve a draft of programs and a progression within a time frame which the E.M.W.G. will exercise due diligence.

Appendix B4: Talloires Declaration

Association of University Leaders for a Sustainable Future

The Talloires Declaration
10 Point Action Plan

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 and water 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. Thus, university leaders must initiate and support mobilization of internal and external resources so that their institutions respond to this urgent challenge.

We, therefore, agree to take the following actions:

1) Increase Awareness of Environmentally Sustainable Development
Use every opportunity to raise public, government, industry, foundation, and university awareness by openly addressing the urgent need to move toward an environmentally sustainable future.

2) Create an Institutional Culture of Sustainability
Encourage all universities to engage in education, research, policy formation, and information exchange on population, environment, and development to move toward global sustainability.

3) Educate for Environmentally Responsible Citizenship
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 have the awareness and understanding to be ecologically responsible citizens.

4) Foster Environmental Literacy For All
Create programs to develop the capability of university faculty to teach environmental literacy to all undergraduate, graduate, and professional students.

5) Practice Institutional Ecology
Set an example of environmental responsibility by establishing institutional ecology policies and practices of resource conservation, recycling, waste reduction, and environmentally sound operations.

6) Involve All Stakeholders
Encourage involvement of government, foundations, and industry in supporting interdisciplinary research, education, policy formation, and information exchange in environmentally sustainable development. Expand work with community and nongovernmental organizations to assist in finding solutions to environmental problems.

7) Collaborate for Interdisciplinary Approaches
Convene university faculty and administrators with environmental practitioners to develop interdisciplinary approaches to curricula, research initiatives, operations, and outreach activities that support an environmentally sustainable future.

8) Enhance Capacity of Primary and Secondary Schools
Establish partnerships with primary and secondary schools to help develop the capacity for interdisciplinary teaching about population, environment, and sustainable development.

9) Broaden Service and Outreach Nationally and Internationally
Work with national and international organizations to promote a worldwide university effort toward a sustainable future.

10) Maintain the Movement
Establish a Secretariat and a steering committee to continue this momentum, and to inform and support each other's efforts in carrying out this declaration.

1994 Updated Version

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Appendix B5: UCT MRF Proposal

Draft Copy

UNIVERSITY OF CAPE TOWN WASTE RECYCLING CENTRE

Contents Page

UNIVERSITY OF CAPE TOWN WASTE RECYCLING CENTRE

BRIEF FORMULATION

Qualitative Requirements

The Waste Recycling Building Centre is envisioned as a building, which the University could use to enhance its reputation for good environmental practise and sympathetic urban renewal, and at the same time benefit from lower costs of waste disposal.

The main aim is to create a building, which will make a strong architectural statement from which environmental lessons could be learned, and to demonstrate, through its design:

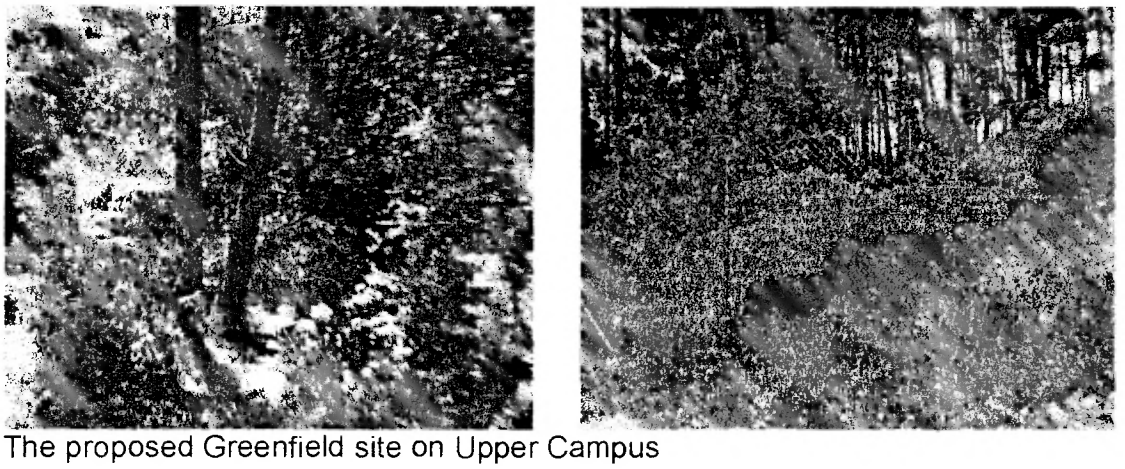
- The appropriate use of natural resources,
- The promotion of other environmental aspects such as recycled materials to be used in construction,
- The reduction of the risk of environmental pollutants,
- The minimum effect to the ecology of the site.

The structure should incorporate thermal mass fabric cooling systems, such as controlled opening windows and nighttime purging which helps keep the building cool during the day.

The building must make extensive use of recycled water and natural energy sources.

The building should be designed so that the building itself can be readily recycled, or reused in another form, either through functional change or the re-employment of elements of construction.

The site allocated for the Recycling Centre is a green field site behind the Educare Centre on the Upper Campus, which houses a crèche for children between the ages of 3 months to 6 years. The landscape strategy should be to reinforce the existing flora and fauna, biodiversity and ensure the well being of existing mature trees in a way that will enhance the buildings setting.



The proposed Greenfield site on Upper Campus

Therefore priority must be given on issues such as:

- The site's natural features, and ecology.
- Minimising release of any form of pollutants, and odours.
- Reduce the risk of attracting rodents resulting from the recycling programs.

Lastly, one of the key features would be to create a green building, which would not cost more than a standard building per Metre Square and have lower operational costs.

Quantitative Requirements

Administration Section

- **Supervisors Office**

  This should be a cellular office to allow the supervisor to have some confidentiality and also be a suitable reception for visitors. The office will be used as a first aid centre in case medical attention is required.
  Apart from the standard office furniture, space for a mobile treatment trolley should be provided and a sink for hygiene purposes.
  Approximate office area should be 18.00metres square.

- **Toilets and Changing Room Facilities**

  Sanitary accommodation should be provided for both the male and female workers. There should be enough sanitary facilities to cater for 15 males and 15 females.
  Because of the nature of work, providing showers for the workers next door to the changing rooms should encourage hygiene.
  The changing rooms should be able to house lockable lockers and adequate benches. Also provide a sluice area to wash down safety clothes worn by the workers.
  Approximate area of the Toilets/changing room facilities per gender should be 92.00 metres square.

- **Tea Room**

  This should be a separate eating-place with a kitchen sink and work space. The room should be large enough for a table and chairs to accommodate the maximum number of employees at any one time.
  The approximate area 42.00 metres square.


Staff Kitchen

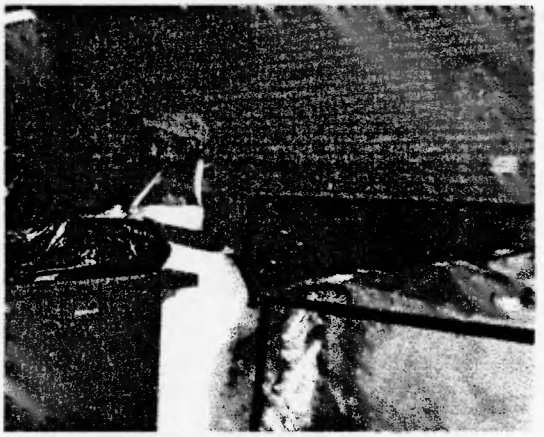

Staff Tea Room

Waste sorting and Recycling Section

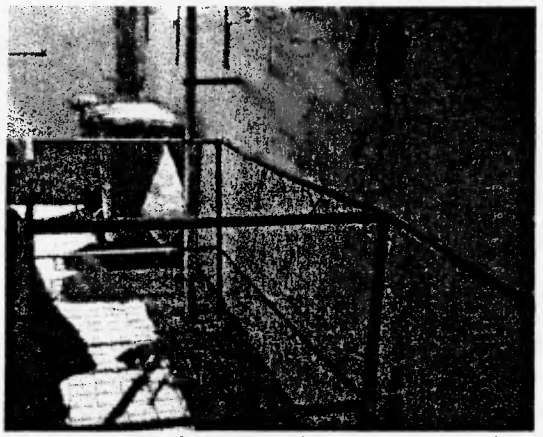
- **General Sorting Area**

This area is to sort out the solid waste into different recyclable sacks such as paper, aluminium cans, plastics etc. Waste that cannot be recycled is finally diverted to landfill.
Five workstations are required in this area. These stations should be large enough to accommodate a sorting sack frame size 2000mm x 1050mm x 900mm high. The workers must be able to wheel in wheelie bins in and out of these areas easily.


Sorting of the Wheelie Bins


Sorting out Wheelie Bins

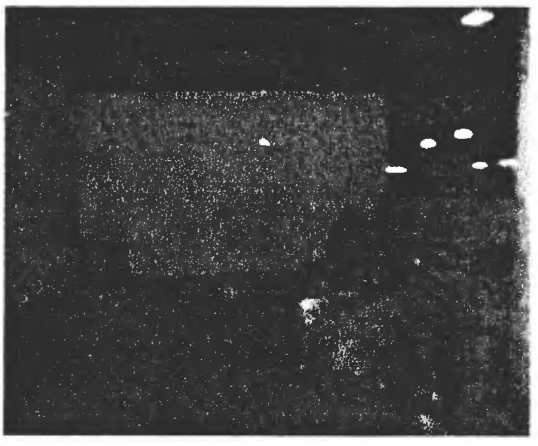
The ideal configuration is to set up the sorting frames in an L shape to allow for the sorter to pull up a wheelie bin and sort it out recycle items into the sacks efficiently. The frames are steel rectangular frames with hooks to hold recycle bags which when full are removed, sealed and taken to the storage area awaiting collection.
Provide a bactericidal vapour machine to eliminate air borne bacteria, which may be emitted from waste and may harm the workers.
The approximate area of the sorting bay is 65.00 metres square.


The sorting frames with out the sacks


the sorting steel frame with the sacks

- **Storage Area**

  When the waste has been sorted out into the various categories, these recyclables are then stored while waiting to be collected and taken to plants for the recycling process. Separate storage for each waste type should be provided in this area.
  The storage area must be within easy access of the loading bay.
  The approximate area of the storage bay 40.00 metres square.

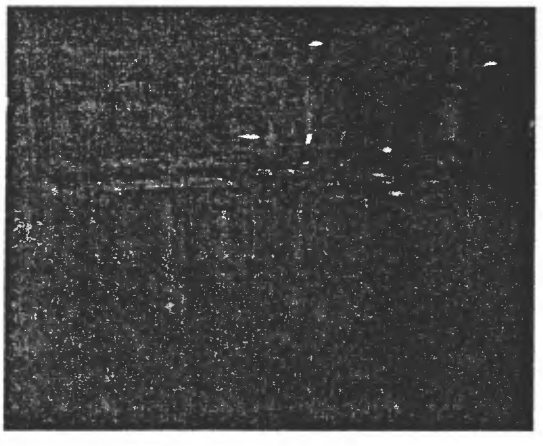


Storage Area

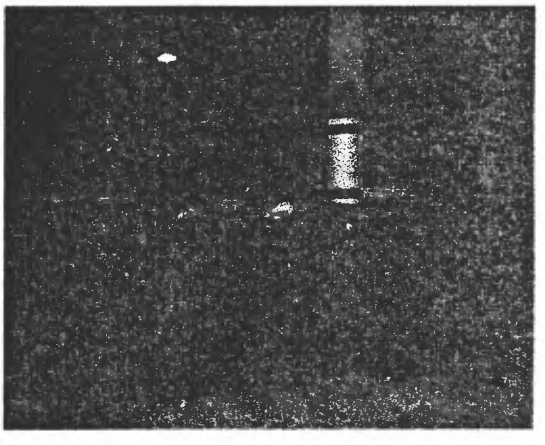
Storage Area

- **Bin Storage Area**

  Two storage areas are required for wheelie bins. The first storage area will be used to store bins that have been delivered to the recycling centre for sorting. This should therefore be located close to the sorting centre.
  The second storage area will be located close to the washing area to store clean wheelie bins ready for re-distribution.
  The approximate area of the Bin storage Area should be 65.00 metres square.



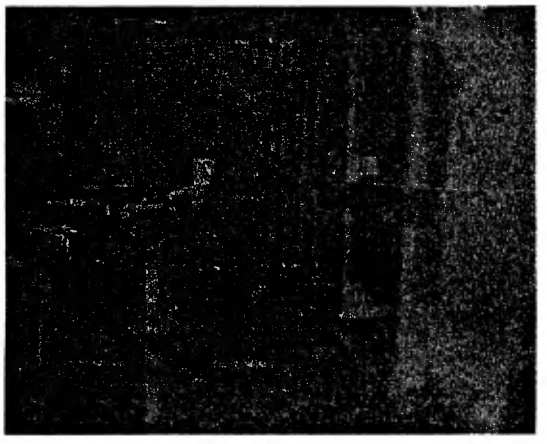
Clean Wheelie Bin Storage



Bin Storage before Sorting

- **Compactor Machinery**

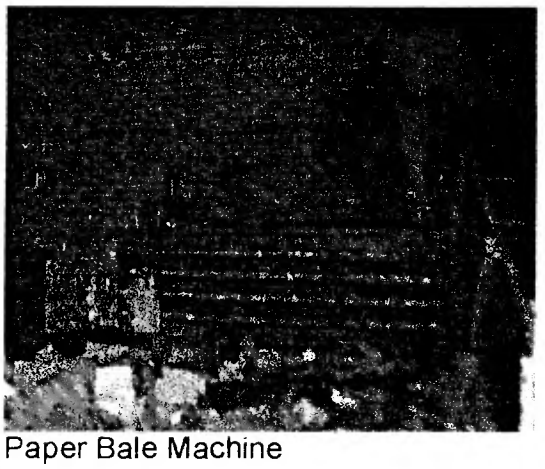
  The compact baling machine deals with compacting solid waste ear that can only go to landfill. This is a very wet and messy process, which requires a floor drainage system. The drainage system in this area should be designed in such a way that solids are separated at source.
  The ideal location for this bale machinery would be as close as possible to the sorting area.
  The approximate area required to accommodate this machine is 55.00m².

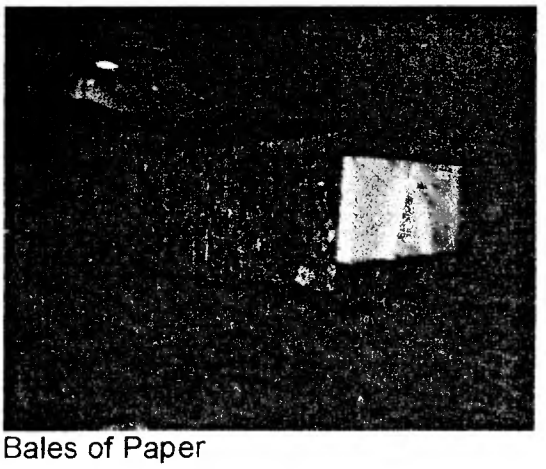
Solid Waste Compacter Machine

- **Paper Bale Machine**

  The bale machinery is used for baling paper/cardboard for easy transportation. The machinery would have to be located as far away as possible from any wet and messy activities to avoid cross contamination and soiling of paper.
  Allocate a covered area of approximately 70.00m².



Paper Bale Machine



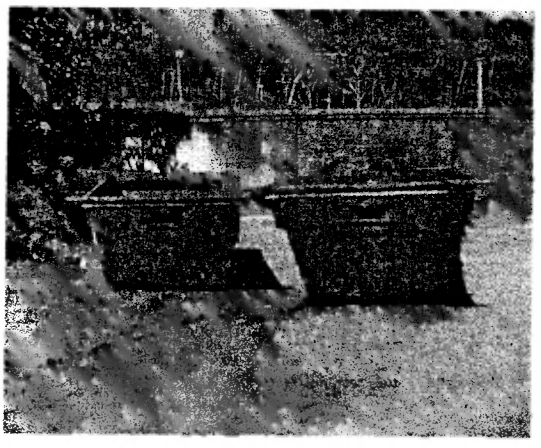
Bales of Paper

- **Bin Washing Area**

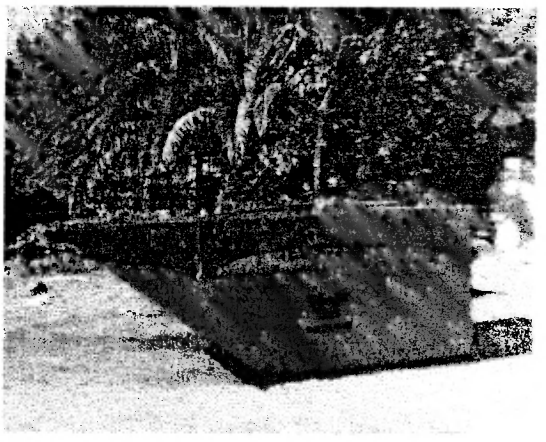
  This area will be used for cleaning all wheelie bins with jetted water, after the contents have been emptied. The drainage system for this area should be such that separates the leftover solid waste from the liquid wastewater. The use of biological waste treatment systems to treat wastewater on site and recycle wastewater should be investigated.
  The approximate area of the washing area should be 45.00 metres square.

- **Skip Area**

  Provide an area for the sole purpose of accommodating a 5.5m³ minimum size skip for general waste use. This area can be in an open yard easily accessible from the road. The road surface or ground surface should be designed to take loads of minimum 12-ton trucks.
  Allocate approximately 15.00m² of loading bay.



Skips



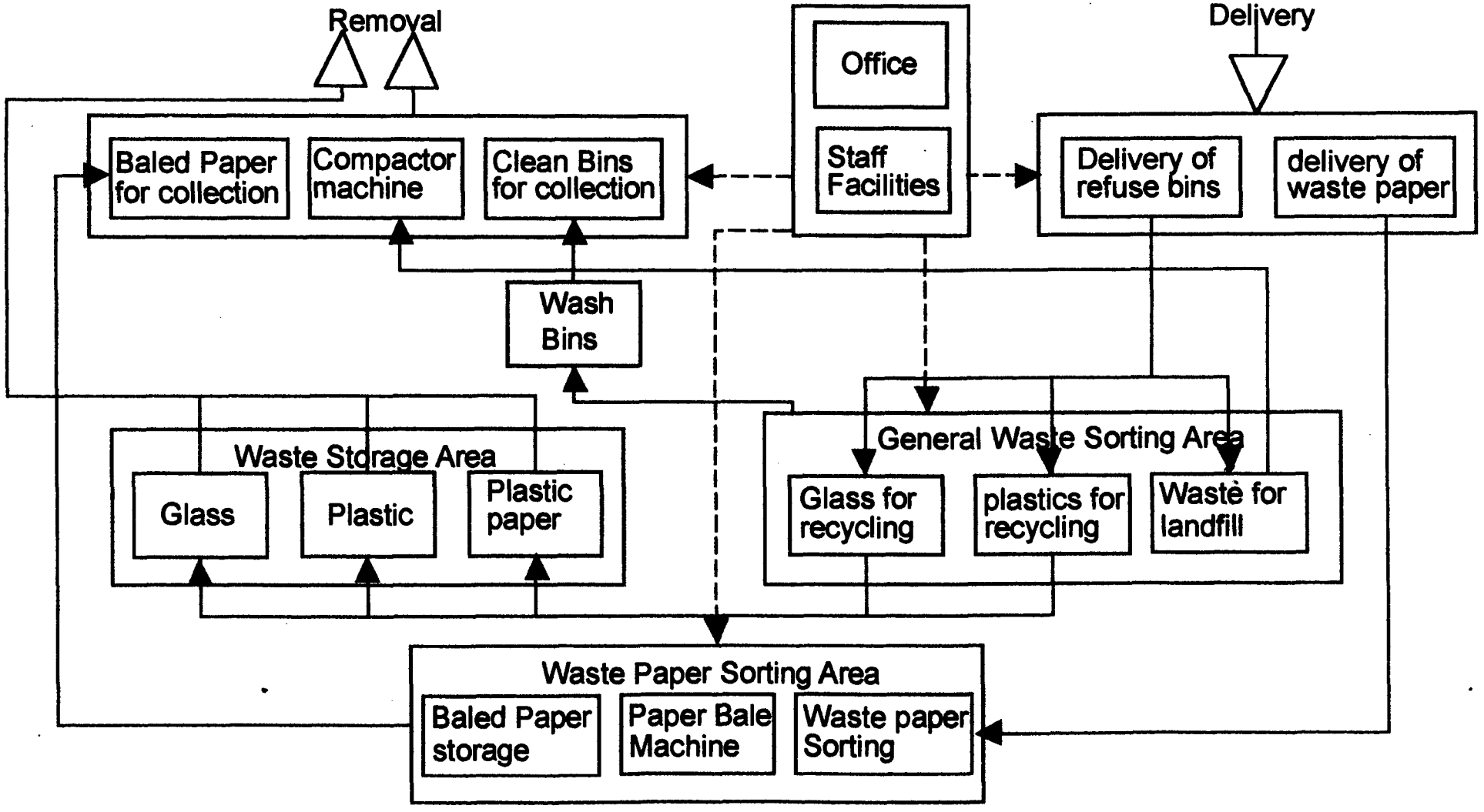
Skip

- **Loading Bay**

  The area should be large enough to turn around a refuse collection vehicle. Allow space for front-end loader trucks to drive in and load baled paper container, turn around and drive out of the recycling centre. The loading bay surface should be able to take a minimum of a 12-ton truck.
  The area required to include turning radius of 180° will be approximately 735.00m².

SOLID WASTE management RECYCLING CENTRE

The diagram illustrates the relationship between zones and activities within the recycling centre.



SUMMARY OF FLOOR AREAS

	ROOM/AREA	TOTAL AREA M²	EQUIPMENT
1.	Supervisors Office	18.00m²	Desk, 3 chairs, And first aid trolley.
2.	WC/changing rooms	50.00m²	Lockers for each worker And bench.
3.	Tea Room	42.00m²	Table to fit 15 chairs
4.	Sorting Area	65.00m²	Steel sorting frame
5.	Recycle Storage Area	40.00m²	N/A
6.	Bin Washing Area	45.00m²	Jet steam spray System Machine
7.	Bin Storage Area	65.00m²	N/A
8.	Compactor Machine	55.00m²	15m³ Compactor machine.
9.	Paper Baling Machine	70.00m²	2.5m³ Baling Machine.
10.	General circulation area	50.00m²	N/A
	Total Building area	500.00m²	
11.	Area for skip	15.00m²	5.5m³ min. yellow skip.
12.	Loading bay	Approx. 735.00m²	N/A
	Total External Area	750.00m	
	Total	1250.00m²	

Standards for Environmental Building Performance

The strategies to be adopted when designing the building are as follows:

- **Building and Site Relationship**

  The whole project should be designed to minimise negative environmental impacts on surrounding area and to maximize opportunities to restore natural systems.
  Identify and mitigate all site problems that are envisaged such as contamination of soil, water and air, as well as negative impacts, which will be caused, by machinery noise and the removal of certain vegetation to make way for the building.
  An inventory of existing vegetation and identification of any species or significant habitats must be taken.
  Survey topography and water features to better understand grading and drainage issues.

- **Internal Thermal conditions**

  Use a high performance building envelope to minimize conflicts between solar heat gain and daylight to a 'fine-tune' the facades in response to solar exposure, and develop a modular façade which can be modified according to external conditions and user requirements.

  Naturally ventilate the building through out the year by using optimised window configuration and nighttime free cooling.

  The internal temperatures should be approximately 25° C in summer with 55% humidity and 20° C in winter.

- **Daylight and Artificial Lighting**

  The basic daylight targets are to achieve 3% to 6% daylight factor (DF)
  With in 75% of the total floor area.

  Provide 600 lux artificial lighting in sorting areas and 300 lux in the office and rest of the building.

- **Energy Efficiency Requirements**

  Aim to strategically minimise load requirements to save on infrastructure costs.
  Design the building so that less energy is used to perform tasks.
  Incorporate energy devices that provide comparable or better quality of service while using less energy than conventional technology.

- **Water Efficiency Requirements**

  Select plumbing fixtures, equipment and fittings, which minimize end use of water (consider faucet aerators instead of conventional shower heads, low-flush toilet systems) and conserve water quality.
  Because of the nature of work in the recycle centre, ensure the optimal quality of water at the tap—potable water that is both safe, (non-toxic) and aesthetically pleasing (taste, colour, odour).
  The University will encourage any initiatives, which involve on-site water reclamation and re-use.

Summary

The Recycling Building Centre is step towards the University of Cape Town making waste management practises as environmentally sound as possible.
The main aim is to reduce the amount of solid waste, which is finally deposited on the landfill sites.

Through this practise the University will be able to greatly reduce the waste collection and disposal costs.

Building should undoubtedly be unique, make a strong architectural statement, which should be founded on sound, widely applicable principles of environmental design.

Through the practise of environmental responsiveness the new development should preserve as much of the Greenfield's and have minimum damage to the topography and ecosystem.

The estimated costs of the actual construction works are:

Appendix C2:
General Overview of Solid Waste Management at UCT

C2.1 Introduction to Past Initiatives at UCT

The University of Cape Town has undertaken a number of solid waste activities over the past few decades but with minimal success. Consequently there has been no continuity with initiatives. Early concerns about the litter problem were registered as far back as the late 1970s and early 1980s. A few initiatives were mooted but very little success was registered. In the 1980s a litter control project was launched with help of 'keep South Africa tidy'. The project did not win support from students as far as commitment is concerned. But lack of student commitment should perceived in light of the socio-political context prevailing at the time when student consciousness was inclined to the liberation struggle against apartheid. It is highly unlikely that a project such as litter control would rank highly on the students concerns.

The 1990s saw a big project on waste recycling being launched under the auspices of the organisation for applied research (OAR) headed by Dr Frank Raimondo. The project recorded some degree of success in the few years after it launch. Between 1994 and 1995 the project seemed to have experienced difficulties. Today very little activities still give testimony to the project.

Around 1995/6 the recycling of waste was non-existent on campus and all the solid waste was being carried to 'wasteman' landfill for disposal. This continued till around 2000 when fresh considerations of a recycling centre were being made. Sorting began on campus in 2002, but was short lived due to concerns from the residents about the presence of odour attracting flies. This was terminated and transferred to sorting centre owned by the company contracted to collect waste on campus, Don't Waste Services (DWS).

A review of the background brings to light a major challenge that the waste minimisation strategy must take cognisance of the role of students. This has not been well addressed in the various initiatives undertaken in the past.

C2.2 The 1970's: Committees

Early initiatives go as far back as the late 1970s when the issues relating to waste management were mainly focusing on litter control as opposed to waste minimisation. The General Purpose Committee (GPC) at the time played the role that is today being played by the University Building and Development Committee (UB&DC) as an overall decision-making body on maintenance and environmental issues affecting the campus. In pursuit of a solution to the litter problem on campus, the GPC first sought guidance from an organisation known as "Keep South Africa Tidy" on how to tackle the problem. Out of the discussion with the organisation the GPC resolved that as an initial step the UCT should put in place a broadly based committee charged with the task of "analysing the litter problem at UCT and formulating remedial measures"[1]. The committee was to have representation from all university levels such as the Council, Senate, Administration, SRC, Academic and Tutorial Staff associations[2].

C2.3 The 1980's: Litter Control

In early 1980s, the first project to deal with litter on campus was launched. Professor Vincent Grandeur from the Faculty of Civil Engineering was the coordinator. Under this project, pairs of bins were placed around the campus but mainly around the front of the Jameson building. One bin was for glass and the other for paper. The project also had an "Envirac photo project"[3] component that aimed to photograph unacceptable littering behaviour and to display in the students union building the photographs of those caught.

The initiative failed because students deliberately threw litter around so that they could be photographed and displayed on campus. In an attempt to raise the student's awareness of litter on campus, the litter was

not collected for almost a month. This also failed to change the attitudes of students, since the accumulating waste did not concern many students.

C2.4 The 1990's: UCT Recycling Campaign

A second project was undertaken in 1992. The project, known as the "UCT Recycling Campaign" was launched on the 29th September 1992. The campaign arose out of a report submitted by the UCT branch of Earthlife Africa to the UCT Administration in early 1992. The report emphasized the need of such an initiative and the importance of the participation of UCT staff and students. The aim of the project was to impress upon the UCT community the need to reduce consumption, re-use where possible, and recycle, or save for recycling, any products where there was a viable market[4]. UCT became the first university in South Africa to institute a comprehensive recycling programme on campus[5].

The UCT administration regarded the Recycling Campaign as the first of the series of events, which was to take place under an environmental policy that was to be formulated. The UCT administration further had intentions of arranging for an environmental Audit to be carried out early in 1994, which was aimed at leading a campaign to reduce water and power consumption on campus.[6]

2.4.1 The Green Team

The Administration requested the Organisation of Applied Research (OAR), headed by Frank Raimondo, to act as a consultant in introducing and managing the campaign. Frank Raimondo reported directly to the Deputy Vice-Chancellor. The UCT Buildings and Services Department were running the campaign on a day-to-day basis. A waste collection team known as the 'Green Team', made up UCT workers, was tasked to collect waste from various collection points.

2.4.2 Recycling Bins and Can Crushers

The campaign introduced a number of bins arranged in fours with different colours (blue green, yellow and grey) at identified drop off points around campus. The bins were meant to capture separately the cans, glass, paper and general waste. Sappi supplied four office bins to capture four grades of paper: office paper, newspaper, corrugated and Kraft boxes, and mixed waste[7].

The main recycling depot was at a site just below the sports centre. The project also provided can-crushing machines, which were placed at various points including the area in front of the Jameson building for students to crush the cans. A notice board was located at the entrance to the students union on which all information regarding the recycling campaign was shown. It included among other things information on press releases, statistics of amounts collected and a map of campus showing the location of various bins. Wasteman supplied the bins placed outside at various strategic points while those placed in offices and at the recycling point were supplied by Sappi. Consol Glass supplied bottle banks at the recycling centre for collection of bottles.

2.4.3 Long term Contracts

Long-term contracts were entered into between UCT and major users such as Sappi (paper recyclers) who supplied bins for each office as well as paper banks outside. The cost of the baskets supplied by Sappi was partly being paid for by the proceeds from recycled paper sales[8]. Paper was collected from upper and lower campus and the Hiddingh campus. There was also the intention to extend the campaign to the medical school. The end of 1994 GSB and Medical catered for school and residences[9]. As well as the paper contract with Sappi, UCT also entered into long-term contracts with Consol Glass who supplied bottle banks and National Metals who paid for the cans collected by the campus community[10].

2.4.4 UCT, the First with Recycled Paper

A 100% recycled paper known as 'Reviva' was produced and was the first locally recycled paper in South Africa[11]. It was made available only at the UCT bookshop and the UCT printing department[12]. The Monday paper during the period of the project was also printed on 'Reviva' and carried the recycling logo.

2.4.5 Training and Collection

The cleaners, who were also part of the collection process, received some training in this regard and received a percentage of the proceeds from the recycled waste[13]. They were trained to empty the paper bins on a daily basis into bags that were stored in a convenient area in each building on campus. The bags were collected by the 'Green Team' and taken to the UCT recycling depot. The bags were deposited into large containers supplied by Sappi[14].

2.4.6 Departmental initiatives

A few departments had taken initiatives to recycle waste paper. Among such departments were the Accounting and Physics departments. The system in the Physics department was that Nampak,[15] collected paper from the department. The staff who organised the collection and storage benefitted from the initiative.

The departmental initiatives were incorporated into the 1992-recycling project. Currently a few departments are still recycling their waste paper, including the Accounting department, which derives revenue of about R 1000 a month. During the period of the UCT-wide recycling campaign there were some departments that resisted being incorporated into the campaign, the Accounting department among them. The Accounting department initiative has continued to date because of the stance it took to keep the control of waste paper recycling at departmental level.

Some departments, though not recycling on the departmental level, did not co-operate with the 1992 paper sorting initiative.

2.4.7 The Success

In its first year of operation, approximately 100 tonnes of paper, 25 tonnes of glass, and 5 tonnes of cans were collected and sold. This resulted in the saving of 400 cubic metres of recyclable waste or 40 compactor truckloads[16]. The recycling project also made a profit of R 12,000: R6 000 was given to student library funds, and the other R6 000 was distributed to the various sections that were involved in collecting the paper.

The total amount of money received during the period 1993/94 was R 19 000: [17]

Allocations	*Amount*
5% to OAR for Management Fees	R950
To private collection costs to date	R3 140
To Reserves	R2 640
To Library Fund as agreed	R6 000
For distribution to departments	R6 000
TOTAL	R19 000

Table C2.1 Allocations from Recycling Project 93/94

Statistics for a two year period of the project on paper collected from residences, lower campus, upper campus, Hiddingh campus, Medical school and Graduate School of Business is given in the table below:[18]

Year	1993	1994	% Change
Number of bags collected	6000	10 000	+ 66%
Total tonnage	95	145	+ 53%
Income received before deduction of collection costs	R18 000	R34 000	+ 88%
Income received after deductions of collection costs [19]	R12 000	R10 000	- 16.7%

Table C2.2: UCT waste recycling project 93/94

The table shows an increase in the amount of paper generated by UCT both in terms of number of bags and total tonnage. But profits decreased: in 1993 an amount of R12 000 is recorded, while in 1994 the amount dropped to R10 000. The drop in the amount can be attributed to an increase in operation costs, amongst other things. The income generated was generally small in comparison to the nature and size of the project.

The proceeds after costs of collection was split 50% to the library funds and 50% for distribution to departments and residences in proportion to the quantities collected. It was felt at the time that in future no direct payments should be made for collections but prizes be allocated to departments that will be considered to have done well and collection figures will be published every month on the notice board[20]. This idea was not implemented.

2.4.8 The Failure

The project ultimately failed due to increasing operation costs, amongst other things.[21] The project was not financially viable as the profits were insufficient to create an incentive for the project. The viability of the project had not been adequately researched. There had been enthusiasm to have a recycling centre and to be the first university in the country to recycle. But insufficient effort was given to assessing the financial viability of the initiative, the role of students and staff, and the mechanism thereof, prior to implementation.

The other reason, which relates to the one above, is lack of commitment on the part of students[22]and some departments[23]. A survey conducted by Oelofse (1993) on '*Attitudes of UCT students to recycling on campus*' discovered that the number of students who were involved in the recycling project was lower than the number of students who had indicated a preference for a recycling programme[24]. This implies that though students can have a rational understanding of what recycling entails it does not necessarily follow that they will be committed to its principles. The survey illustrated the need to focus on issues that limited the full participation of students in the programme. It recommended that there was a need to develop an 'internal locus of control' with regard to the programme[25], and also that students should have continual access to information.

Another reason for the failure of the project was the lack of appropriate structures to implement the programme. Consequently the project collapsed when Frank Raimondo left the University.

There was a concern that new and used paper was being removed from campus and sold for cash by some members of staff. This was against the 'UCT policy' which required that all used paper on campus be sold through UCT Recycling which was managed by UCT OAR[26].

In an effort to reduce costs, the project (through the Registrar) proposed to give awards to departments that performed well rather than reward individual staff involved in the project. The suggestion was not welcomed by the Physics department who prior to incorporation into the recycling campaign project, had their own initiative that was up and running and managed to satisfy those involved in the collection of waste paper. The suggestion was considered to be a disincentive. It was argued, instead, that "*a system be put in place that works for both management and workers, a policy that is supportable and beneficial in the widest sense rather than removing the incentives for the workers.*" [27] Before the recycling campaign, workers in the physics department had received R80 a year, but after incorporation into the recycling campaign, they received far less: R40. This brought about dissatisfaction as workers felt it was not worth it[28].

While departmental initiatives were successful, they did not focus on students. Their focus was on gaining back revenue from the waste paper in their departments.

In August 1993, the 'pick up' or green team was subcontracted to a private enterprise[29], but control remained under UCT. Collection was contracted out to reduce on operation costs incurred in terms of staff and vehicles,[30] coupled with dwindling number of bags of waste paper. The move to subcontract was preceded by the proposal to 'deregulate' the sale of paper in order to solve the problem of uncooperative departments and private sales by individuals and departments. The Southern Recycling Company was given the contract to deal directly with departments at UCT on the understanding that departments retain the right to look for better deal if the one suggested was not acceptable.

The UCT administration later made a decision that the recycling campaign was to be self-sufficient and that no subsidy was to be given to the project.[31]

2.4.9 Anti-litter campaign strategy

In 1995, Properties and Services department initiated a tough anti litter strategy, co-ordinated by a graduate intern (Ellis Boban) whose task was publicising and implementing the campaign through consultation with students and staff bodies. The strategy came from a decision by the senate and Council aimed at making UCT a clean campus once again. It was based on the premise that campus litter and protection of UCT's environment are a responsibility of every member of the campus community. The strategy involved dividing the campus into 'precincts', each with a curator who was responsible for all aspects of the environments in his/her area. Curators were charged with the task of ensuring that "each precinct is clean, neat and tidy, and that the fabric of the precinct (buildings, structures gardens and other land improvements) is maintained to a high standard. Curators and their designated persons were also to identify problems and bring them to the attention of the Estates Manager, Duke Metcalf.[32] Reports about their precincts were to be submitted to the Estates Manager.

About 100 new grey bins[33] were introduced around campus for cans and general waste[34]. The bins had colour coded labels; yellow labels for general waste, while orange labels for cans intended for recycling. The strategy was unsuccessful as students did not adhere to separation but just used the bins for any waste[35]. The anti-litter campaign operated alongside the recycling project.

C2.5 The 2000's: A Renewal of Commitment

2.5.1 Talloires Declaration

In 1990 Dr Stuart Saunders signed the Talloires Declaration[36] on Sustainable Development on behalf of the University of Cape Town. This declaration was initiated by university leaders from all over the world who had become concerned with the "...unprecedented scale and speed of environmental pollution and degradation and the depletion of natural resources". In 2002 the Vice-Chancellor, Professor Njabulo Ndebele, recommitted the university to the Talloires Declaration

2.5.2 Environmental Policy Document

Following the recommitment of the university, an environmental policy document was formulated by Properties and Services. The document[37] states that UCT will:

- *Increase awareness of environmental issues amongst students, irrespective of their field of study, through the incorporation into courses of material on the environment and sustainable development.*
- *Promote research programmes aimed at achieving environmental responsibility and sustainable development as part of the University's central mission.*
- *Support the networking and interdisciplinary processing of environmentally relevant issues in research and teaching at the university, also in co-operation with other institutions.*
- *Encourage and provide education on environmental issues to University employees, so that they can pursue their work in an environmentally responsible way.*

The University Council has not yet approved the document.

2.5.3 An Integrated Waste Management Strategy

In its first meeting on the 11th May 2001, the EMWG identified a number of environmental issues for the attention of UCT. The issues identified, among others included the 'integrated waste management

strategy. The EMWG made a brief on the same to the UB&DC. The committee felt strongly that the idea on waste management be pursued as it held substantial benefits for the UCT[38].

The Environmental Management Working Group, in response to the Talloires Declaration and the government's National Pollution and Waste Management Policy, undertook a process of developing a Waste Management Plan. (See Appendix B3) The objective of the plan is to provide for effective and efficient waste management on the Campus, which has regard to environmental and economic costs and benefits, and which ensures that the management of waste does not cause a nuisance or is injurious to health. The aim of the plan is for a **60% reduction** in the amount of waste disposed of in landfills from the University properties, in as practical a time frame as can reasonably be achieved.

The EMWG emphasises a change in thinking by prioritising the need for University faculties, through waste management plans, to reduce/avoid waste. This is a significant change from simply requiring the waste disposal contractor to be responsible for collection and disposal of waste on behalf of the University.

2.5.4 2002 - Waste Sorting for Recycling

After the collapse of the recycling campaign in the 1990's, a greater proportion of solid waste was being transported to landfill by Wasteman, contracted to collect waste. Don't Waste Services was engaged in September 2002 to take over the responsibility for solid waste collection from Wasteman. Solid waste was collected by DWS twice a day on a rotational basis and delivered to a temporary sorting centre behind the old Chinese school in Avenue road where the waste was sorted into various recyclable components.

In a seven-day trial period the total amount of waste collected from UCT upper campus was estimated at 92 cubic metres. Out of this, 18 cubic metres were not recyclable and went to landfill. The balance of 74 cubic metres (80 %) was recovered from the general solid waste through the sorting process and sent to be recycled. Due to concerns raised by neighbours in Mowbray, site limitations and cost implications, sorting on campus was stopped and waste is now taken to the DWS sorting centre at the Airport Industria.

The previous mode of collection by Wasteman using skips was deemed unfavourable, because the skips were open to the wind and were considered an eyesore on campus[39]. The current Otto bins (wheelie bins) replaced the skips. A total of 220-Otto bins were spread across UCT upper campus at collection points and drop off points[40]. The bins have a capacity of 240 litres. The solid waste from various sections of UCT is collected in black bags and the bags are taken to the wheelie bins. The waste is collected by DWS on a daily bases and taken to their sorting centre at Airport Industria.

At the sorting site the waste is put into UCT designated Otto bins. It is later sorted into various recyclable constituents. There are about 40 potential categories into which the solid waste can be separated. After sorting the recyclable waste is weighed and packed in bundles ready for sale to the various markets that require it. The non-recyclable waste is also weighed and compacted ready for disposal at the landfill. Compaction is meant to reduce the size of the waste and so minimise space taken in the landfill. It further reduces the cost of disposal. In the contractual arrangement between UCT and DWS (not yet finalised at the time of study), UCT is charged R 38,000 per month for DWS service, less a minimum of R 5,000 income from the recycling.

This chapter has endeavoured to give an overview of recycling and solid waste management initiatives at UCT; the challenges and constraints encountered by the initiative. It has also endeavoured to outline the current scenario as far as waste sorting and recycling is concerned. A number of lessons can be drawn from this overview to avert similar shortcomings recurring in the proposed MRF initiative. Below is a summary of lessons learned.

Summary Box: Lessons learned

- There was lack of an adequate **economic assessment** of the 1992 UCT Recycling Campaign. The project became costly for UCT because of the unforeseen costs. Before a similar initiative can be undertaken an adequate economic assessment must be done.
- There was lack of an **adequate and appropriate institutional structure to implement the project:** Appropriate structures and mechanisms are needed for solid waste management at UCT, which effectively and adequately involve staff and students. Calling on departments to cooperate is not enough.
- Lack of **'sustained awareness'** on the part of students resulted in lack of commitment to the recycling campaigns. Good publicity and awareness building is vital.
- There was **lack of incentives** to encourage students, academic staff and cleaning staff to minimise waste.
- **Policy:** Lack of policy for the University of Cape Town on solid waste management prior to 1990 and lack of commitment to the same afterwards.
- **Departmental initiatives** to recycle paper seem to be more effective than having a centralised control of the process. This is the one aspect of the 1992 campaign which is still happening today -- 43% of departments interviewed as part of the *Initial Review toward an EMS* claimed to be recycling paper. The option to devolve the responsibility of recycling at the departmental level should be pursued.

C2.6 Institutional Arrangements at UCT

Institutional Aspect of UCT	*Role*	*Comments*
Properties and Services (P&S)	• In charge of the entire UCT property/facilities and their maintenance. • Estates and Custodial (EC) services unit of P&S directly coordinate waste management.	
Campus traders Formal foods outlets and catering residence kitchens	• Sources of general solid waste	• The Property Administration section of P&S administers the leases and contracts. • Contractual opportunity to control types of food waste and have a significant reduction on food waste.
University Building and Development Committee (UB&DC)	• This committee has overall decision-making powers relating to new building developments and maintenance of existing stock.	• UB&DC will have final say on whether a MRF should be built on campus.
Environmental Management Working Group (EMWG)	• A subcommittee of UB&DC in accordance with the principal's circular IA/2001of 7 Feb 2001. • It is an advisory body to both the UB&DC and P&S on environment related issues	• Committee felt strongly that the idea on waste management be pursued as it held substantial benefits for the UCT[41].
Student Representative Council (SRC)		• SRC can encourage students to participate effectively in waste minimisation • Student attitudes had been a major challenge for UCT's past waste management recycling initiatives.

The DVC portfolios	• The university executive team comprising the VC and four DVCs encompass a number of relevant committees and boards.	• Currently issues are directed by EMWG to DVC Prof. de la Rey[42] • DVC structures exists but do not have a specific orientation to sustainability at UCT, ie. waste management.

[1] Extract from General Purpose committee resolution, P/C 350, 1978
[2] Extract from General Purpose committee resolution, P/C 350, 1978
[3] Extract from Student Affairs Committee minutes on 'litter on campus'; 13 October 1977.
[4] Monday Paper September 14-21 1992 volume 11 (28)
[5] Green Issues: Varsity October 1992, volume 51 (9)
[6] UCT Circular No. 11/94: Subject UCT Recycling Campaign, From Registrar to Executive Officers, Deans, HODs
[7] Monday paper September 28 – October 5 1992 volume 11 (30)
[8] Oelofse C, (April, 1993) A Survey of the attitudes of UCT students to the recycling programme on campus, Report No. ZA 295 (30) for SANF.
[9] Monday paper, October 1994 Volume 13 (38)
[10] Monday paper September 28 – October 5, 1992 Volume 11 (30)
[11] Monday paper October 11 - 18, 1993 Vol ume 12 (32)
[12] Monday paper October 4 - 11, 1993 volume 12 (31).
[13] Prof. R Fuggle – Personal communication, 11/3/2003
[14] Oelofse C, (April, 1993) *A Survey Of The Attitudes Of UCT Students To The Recycling Programme On Campus*, Report No. ZA 295 (30) for SANF.
[15] Memorandum on UCT Recycling Campaign, 3/2/1994, Letter from Dr Ball to Mr Amoore
[16] Monday Paper March 21 –28, 1994, volume 13 (5)
[17] Letter from OAR to Registrar, 12/11/1994
[18] Monday paper, October 1994 Volume 13 (38)
[19] See previous section
[20] UCT Circular No. 11/94: Subject UCT Recycling Campaign, From Registrar to Executive Officers, Deans, HODs etc
[21] Frank Raimondo, personal communication 16/5/2003
[22] Prof. R Fuggle – Personal communication, 11/3/2003
[23] Minutes of meeting of Recycling committee, 29/ 11/ 1995
[24] Oelofse C, (April, 1993) *A Survey Of The Attitudes Of UCT Students To The Recycling Programme On Campus*, Report No. ZA 295 (30) for SANF.
[25] Internal locus means an individual's belief reinforced for certain behaviour- Oelofse C, (April, 1993) *A Survey Of The Attitudes Of UCT Students To The Recycling Programme On Campus*, Report No. ZA 295 (30) for SANF.
[26] UCT Circular No. 11/94: Subject UCT Recycling Campaign, From Registrar to Executive Officers, Deans, HODs etc
[27] Memorandum on UCT Recycling Campaign, 3/2/1994, Letter from Dr Ball to Mr Amoore
[28] Memorandum: Recycling project, From Dr Ball to Mr Metcalf , 12 July 1994,
[29] Monday paper, August 9 –16 1993 Volume 12 (5)
[30] Group meeting with Duke Metcalf and Lillian Campbell, 31 March 2003.
[31] UCT OAR, Letter from Dr Raimondo to Mr Low; 3 May 1994.
[32] Memo from Registrar, Amoore H to Curators of precincts, 5 June 2001
[33] Duke Metcalf 27 March 1996; Anti-litter campaign Newsletter No. 1/96
[34] Monday paper June 17 –24, 1996 volume 15 (17)
[35] Group meeting with Duke Metcalf and Lillian Campbell, 31 March 2003.
[36] The Talloires Declaration 1990;
[37] Environmental and sustainable development policy for UCT, Revised Draft.
[38] Memorandum- general feedback; EMWG matters; 6 June 2001
[39] Monday paper November 2 – 9 1992 volume 11 (35).
[40] Memorandum- general feedback; EMWG matters; 6 June 2001
[41] Memorandum- general feedback; EMWG matters; 6 June 2001
[42] Monday paper April 22 –27 2003 Volume 22 (9)

Appendix C3: Information on Solid Waste Management, from Interviews for *Initial Review Toward an EMS at UCT*

Dr Laurie Kellaway, Toxic Waste Manager and Health and Safety Officer for Faculty of Health Sciences. *Interviewer: Rich Handler 10 April 2003*

- Paper and kitchen waste (from office kitchens and from Devils Peak Restaurant) are the main types of waste.
- There is a problem of obsolete medical equipment and PCs. Old equipment is difficult to dispose of, and takes up floor (and roof) space in the Department. Some of it could be donated to schools, other parts of it could be scrapped.
- Due to staff turnover and differing research projects, equipment may become unused, although not be obsolete or damaged.

Prof Ralph Kirsch and Prof Peter Meisnner (Health and Safety Representative), Department of Medicine. *Interviewer: Rich Handler 8 April 2003*

- Obsolete medical equipment and computers are the most problematic form of solid waste. They take up office space and are an expense to have removed. Possibilities for disposal include: send to landfill, send to scrapping (recycling of metals), send for refurbishment and donation. Student could be employed to refurbish.
- Paper is the main form of solid waste from offices.

Dr Elisha, Department of Medical Microbiology. *Interviewer: Rich Handler 8 April 2003*

- Paper, paper-towel for drying hands, large numbers of plastic dishes are autoclaved and collected by Wastetech.
- There is an ongoing problem of storing and disposing of obsolete medical and computer equipment. UCT Fixed Assets Department is the contact in this regard (650-2221/2215).
- Paper is collected and recycled by the departmental secretary.

Prof Ken MacGregor and Donald Cook, Department of Computer Science

Interviewer: Rich Handler 7 April 2003

- Obsolete computer equipment, paper, cardboard, polystyrene (from equipment packaging), soft drink cans (aluminium), tea-kitchen waste.
- Between 30 and 40 new computers are purchased a year.
- Paper is removed by Supercare Cleaners – its fate is unknown.
- Obsolete computers are either removed by an outside service provider who scraps them for precious metals (contact Sam Chetty, Computer Science Building, 650-4749) or sent to landfill.
- There have been occasions where waste has been dumped in the open in Chemistry Mall i.e. it is not stored in wheelie bins, since there are only 4 remaining wheelie bins of the original 40.

Prof Michael Wormald, Department of Accounting *Interviewer: Rich Handler 7 April 2003*

- Paper is the main form of solid waste.
- Offices and printing rooms have paper-recycling bins (black wheelie bins and cardboard WoW bins) that are cleared by a private recycling service provider (Vicwil Services), and not by Supercare since it is perceived that they do not recycle. Dept. of Accounting makes R 1000 p.m. from paper recycling.
- There are 1500 first-year students whose leftover student handbooks are recycled.
- Coloured paper use is kept to a minimum (to save costs).
- Ink cartridges are sent away for re-inking.
- Photocopy machines are on full-maintenance contract leases with University Document Management Services (UDMS).

- Paper purchasing is done centrally by UDMS, and depends on best prices. The printer and photocopy leasers are quite specific in their preferences for good quality paper

Chris Briers, Project and Engineering Manager, Properties and Services

Interviewer: Sandra Rippon 7 April 2003

- Sustainable Construction: Policy being implemented for first time on the Chemical Engineering building. An Environmental Management Plan (EMP) forms part of the Contract. This has been reasonably successful, though still a learning process. Project has worked well in terms of health and safety as site has been awarded a five-star rating by BIFSA, a first for UCT. Due to Contractors experience, good co-operation and staff safety induction programme. EMP worked well in recycling of demolition waste.

Prof David Schalkwyk, Department of English *Interviewer: Sandra Rippon 28 April 2003*

- No awareness of UCT environmental initiatives, apart from paper recycling bins initiative some years ago, which has now fallen away. This initiative was taken very seriously, but now staff do not bother, since it is perceived that cleaners do not separate waste. This behaviour was present even before cleaning was outsourced; it is clear that cleaning company has no policy on paper recycling. Prof. Schalkwyk finds this disturbing as the department generates enormous amounts of waste paper. Some administrative staff do attempt to recycle by re-using paper for printing.
- No content in curricula relating to sustainable development or environmental issues. Basic literacy in environmental issues would have to be provided by the university, perhaps during orientation.
- Paper and printing, photocopying (20 000 copies/month) is the largest use of resources.
- Paper is the main form of solid waste. Enormous quantity of photocopying (handouts);
- Offices have paper-recycling bins (WoW bins) that are cleared by Supercare. It is perceived that Supercare does not keep waste separate for recycling and therefore people have given up. The cleaner was seen collecting and recombining all waste in one bag. Cleaner reports that supervisor has instructed them not to keep paper separate.
- Ink cartridges: some inkjet cartridges are refilled, some LaserJet cartridges are bought as second hand are not sent away for re-inking. Problems with quality experienced in the past.
- Paper purchasing is done either from UDMS, or outside company such as Waltons and depends on best prices.

Prof Payne, Steven Inggs and Rod Sauls, Department of Fine Art, Hiddingh Campus

Interviewer: Sandra Rippon 9 April 2003

- No awareness of UCT environmental initiatives such as Environmental Policy or EMWG.
- No content in curricula on sustainable development or environmental issues as not applicable in Fine Art.
- Most/ a large proportion/ of paper waste from both offices and studios is recycled. Recycling is outsourced to a private contractor.
- Sculpture produces solid waste (wood, metal) which is collected in a skip for disposal on quarterly basis.
- Recent change to wheelie bins for general waste.

Interview with Prof Alexander, Dennis Botha, Department of Civil Engineering

Interviewer: Sandra Rippon15 April 2003

- Aware only at general level, through media, awareness of UCT environmental initiatives; not aware of environmental policy, EMWG.
- Content in curricula relating to sustainable development or environmental issues are currently present and due to be increased in substantial curricula review. Main areas are Civil Eng practice i.e. life cycle costing; and more explicitly, in the final year Urban Engineering course; also 4th year Environment Assessment course EGS406F (R. Hill). Hope to begin new course next year.
- Research relating to sustainable development or environmental issues. Strong thrust in terms of water quality, relates to sustainable development, Catchment Management; Urban Engineering programme

has dealt with upgrading of informal settlements. Construction and demolition waste research project carried out last year; now first time a full MSc on this subject.

- Materials Lab produces half a ton of construction waste per month, stored in a skip, which is internally managed. A problem in that it is used for dumping by others, even outside contractors. Even receives old electronic equipment. It is the only skip in the area.
- Electronic equipment waste is a problem in that there is no guideline on what to do with it; dept. do try to return to it to ICTS.
- Some metal waste from Workshop. Usually get a recycler for metal waste.
- Most Offices have paper-recycling bins; paper is separated out by Supercare cleaner (Melanie Adams). Supercare Supervisor gives clear instruction to do this. Paper is generally re-used for printing double sided. Largest amount of paper used for lecture notes.
- Ink cartridges: there was a genuine attempt to re-use a few years back, many complaints about quality problems.
- Dept. has cupboards full of toner cartridges, which don't know what to do with.
- Redundant office furniture, Office furniture dept. used to collect. Now not wanted by Purchasing so is disposed of, seen as unnecessary waste.
- Brown glass demi-jars used for acids, cant get rid of as not recyclable.
- No way to dispose of fluorescent tubes – used to be a special 250 litre drum into which the tubes could be fed, to be ground up; this fell away. Disposal problem also applies to batteries.

Gita Goven and Grant Diener, Department of Architecture, Centlivres Building

Interviewer: Sandra Rippon 8 May 2003

- Paper is the main form of solid waste. Student recycle paper in some studios and not in others, and there is a general lack of awareness. There is a problem of not having the correct bins i.e. only one type, the WoW bin in the offices. The situation with regard to paper recycling is therefore mixed and not consistent. This issue could be introduced into the discussion in first year orientation mornings.
- Paper and other types of waste (aluminium cans) are sorted by Supercare cleaners outside the building and collected by a private recycling service. There has been an issue in the department about who has the right to income derived from recycling waste.
- The Workshop produces some mixed waste, as does the making of models.
- Of most concern in terms of H&S, are the syringes used for glue by students making models, which get mixed up with papers and are a risk to cleaning staff.
- Ink cartridges: a private recycling company collects LaserJet cartridges. No recycling or re-inking is done in terms of ink-jet cartridges (Janine).
- Photocopy machine has double sided function that is used by some individuals when appropriate.
- Paper is purchased from a private stationery company, via the Faculty (Julie) and depends on best prices and service. Paper consumption includes the plan copying paper and CAD lab plan printing.
- The Department has re-used old worktops to make new furniture for refurbished studios, using the departmental workshop.
- The disposal of old equipment as been a problem, with resource rooms packed with old computers.

Geoff de Wet and Lillian Campbell, Properties and Services *Interviewer: Sandra Rippon 7 April 03*

- Paper is the main form of solid waste.
- Offices and printing rooms have paper-recycling bins (WoW bins) but the paper collected is combined with other waste by Supercare cleaners. Incentives were used in past to encourage cleaners to separate waste but have fallen away.
- Ink cartridges not refilled/re-used.
- Double sided photocopy is not encouraged.

Steven Jaffe and Rhino de Jager, Baxter Theatre Complex *Interviewer: Sandra Rippon 22 April 03*

- Paper, beverage containers are the main form of solid waste. All paper waste from marketing material is recycled by Nampak, managed internally. General waste is collected in a skip in car park, collected twice a week.
- Offices have paper-recycling bins (cardboard WoW bins). Cleaning is by Supercare.
- Ink cartridges are not sent away for re-inking.
- Photocopy machines are on full-maintenance contract leases with UDMS.
- Double sided printing is not generally done.
- Paper purchasing is done centrally by UDMS.

John Tunstall and Michael Langley, Risk Management, Properties and Services

Interviewer: Sandra Rippon 8 April 03

- None of the risk management activities produce solid waste.

Hugh Amoore, Registrar *Interviewer: Sandra Rippon 14 April 2003*

- Cleaners are not following through on waste separation. Supercare should have instructions in their contract, to be able to measure service levels. Fire hazard of WoW bin created a setback when this initiative began. Tunstall still opposed to WoW bins, penetration across campus suffered as a result.
- Frank Raimondo launched a paper recycling initiative some years ago, but this failed.

Cafeterias:

- It could be part of UCT contract with cafeteria licensees to limit polystyrene use as packaging. To be phased in over time; polystyrene easily banned from the campus.

Initiative aimed at Student behaviour

- As a Student's environmental action initiative, a waste separation in area in front of Jameson steps may be desirable. (Registrar is Chairman of works of Art) Possibly commission some outdoor sculpture, functional and aesthetic, in a central position between Jammie and Students Union.

Political Will at UCT

- Sectoral policies need to be adopted, to find political will. Once environmental policy is in place, need action on the adoption of sectoral policies. (Diagram of UCT organisational chart was drawn, showing ideas about point of environmental interventions/personnel within the UCT hierarchy).

Old Equipment

- Stockpile of electronic equipment waste is seen as major problem by HA, both in Bremner and across the University. An initiative is needed from the ICTS department, to collect equipment, perhaps recycle, upgrade, re-use where lesser specifications required. The ICTS Department has not adequately addressed this problem.
- Old equipment lies around, as there is no policy on handling this. This is seen as the responsibility of ICTS, and has not been dealt with adequately.

Paper

- Paper is the main form of solid waste.
- Offices have paper-recycling bins (cardboard WoW bins) that are cleared by Supercare; it is uncertain whether they recycle.

Ink cartridges

- Ink cartridges are not re-used/ sent away for re-inking.

***Margaret Fry, UDMS** Interviewer: Zola Hlatshwayo*

- Photocopying: Cannot use recycled paper because the photocopying machines require a certain thickness. Cannot reuse paper because the customer may find it unacceptable. Need to create awareness first. UDMS has seven depots within the UCT. Their main activity is photocopying documents and this involves high consumption rates of paper and toner. The photocopying machines and toners are bought from Xerox and once finished, the toner containers are sent back to Xerox. Xerox is thus responsible for getting rid of them. The paper that is used is bought from Xerox too. The photocopying machines require a certain thickness in the paper that can be used and thus using recycled paper is not possible. UDMS cannot reuse paper because the client requires a certain quality. There would have to be awareness raising first before implementing this option.
- Generation of waste from duplicating documents: Paper Waste (All paper waste is recycled for a small return). Toner (Returned to Xerox to dispose of).

***Ian Mackintosh, Residences** Interviewer: Zola Hlatshwayo*

- Waste generation and separation: Have tried waste separation at source and students did not comply. Ended up injuring staff with broken glass in paper waste bin. There is a need to raise awareness among students before anything successful can be implemented. Waste is separated in the offices although some offices have only one bin.
- Cafeterias: The cafeterias are contracted out. UCT monitors the use of water and electricity. Most of the waste produced is food waste and this is collected by pig farmers. Other wastes include plastic (juice bottles) and metal (cans), boxes- these are flattened and taken with the rest of the waste.
- Waste production peaks at the start and end of short vacation and June vacation and when first tier closes in November. Most of the waste is household waste, food waste and paper waste.
- Waste separation in residences failed because there was no buy in from students. Several stakeholders expected to benefit from the project e.g. students and staff members yet the money was limited. Some strategies are not practical e.g. it is a fire hazard to have several waste bins on the corridor.
- Instead of introducing some new strategies altogether, UCT should look at what went wrong in previous attempts and correct those mistakes.
- Dining Halls: The contractor has not been asked to separate their waste because it is felt that this would be a nightmare. Waste produced is huge. There is an interest in monitoring waste produced so that savings can be traced
- Awareness: The overall important strategy is awareness raising so that we can get buy in from students first before implementing any strategy.
- Offices: Although there is waste separation in some offices, the waste is mixed when collected. It is important to educate the staff members on these issues. The only other concern would be that metro cleaning services has a very high staff turnover rate and this makes it difficult to educate them.

***Eric van Steen, Chemical Engineering** Interviewer: Zola Hlatshwayo*

- Paper consumption: There has been a marked increase in paper consumption due to change in methods of teaching. Lots of photocopies are made for student notes. Research reports to funders have generally increased, contributing to the paperwork.
- Recycling: The department does recycle and reuse. It started before the university initiated its recycling.
- Safety officer: There is a general safety officer for the department who works with several safety officers responsible for different aspects of the building. The safety procedures of the department are above what UCT requires form the departments.
- Curriculum: The curriculum does have a concepts relating to sustainable development e.g. EIA, waste treatment. There was also an awareness of UCT initiative e.g. Environmental Management Working Group, Environment Thrust because a member of the department represented them. There were optional courses GHE417 (Environmental Engineering) and GHE488 (Business, society and environment) that have sustainable development concepts.
- International precedence: The department was aware of international precedence in universities trying to be more environmentally responsible.

Professor Hugh Corder, Faculty of Law *Interviewer: Zola Hlatshwayo*

- Although solid waste is separated at source, it is put in one receptacle and later separated again, which is quite strange. Food waste from the food court downstairs.

Nicolla Illing, Microbiology *Interviewer: Zola Hlatshwayo*

- Supercare collects waste e.g. paper waste, domestic waste. Envelopes are reused.

Mike Meadows & Peter Johnson, Department of Geographical and Environmental Sciences *Interviewer: Zola Hlatshwayo*

- Waste Disposal: The department uses corrosive chemicals e.g. HCL. The fumehood is used although it is not so efficient. The waste accumulates for some time before it is collected. It is stored in a "murky bucket" before disposal. There have been no major incidences. Safety procedures are displayed on the walls

Dr. Jenny Day, Department of Zoology *Interviewer: Zola Hlatshwayo*

- Waste: Paper is recycled and other wastes are collected by super care.
- International precedence: Not aware of any international precedence in environmental management but is aware of recycling initiatives within UCT.
- Curriculum: The curriculum offered by the department offers a wide array of courses that have relevance to sustainable development and does have research initiatives in this regard too.

Loveness Kuanda, Student Development & Services Department

Interviewer: Zola Hlatshwayo 15 April 2003

- The Food Court produces food waste that is disposed together with other waste
- Paper waste produced from offices is separated at source and sent for recycling. Other waste are collected by Supercare from the building
- There used to be a can recycling machine at Upper Campus and this initiative should be revised. There is a glass-recycling depot behind the Sport Centre but there was a feeling that the location was not very convenient for people who may be interested in glass recycling

Allen Rodgers, Chemistry Department *Interviewer: Zola Hlatshwayo 7 April 2003*

- Waste paper is recycled
- Education: The curriculum for second year students has a course in environmental chemistry.

Prof David Dent and Prof Anwar Mall, Department of Surgery

Interviewer: Rich Handler 16 April 03

- Paper and printer cartridges are the main form of solid waste
- It is uncertain whether departmental paper is recycled. Printer cartridges are not recycled

John Whitcombe and Rob March, Graduate School of Business, Breakwater Lodge

Interviewer: Rich Handler 16 April 2003

- The main types of solid waste are: paper, kitchen waste, food waste, glass bottles from bar/restaurant, garden waste, bedroom waste, used ink cartridges, fluorescent tubes
- Glass is placed in a recycling container for collection. Some of the waste in wheelie bins is sorted on-site by a maintenance worker
- Ink cartridges are sold to a recycler. Recycled cartridges are not used because of poor performance in terms of quality and high failure rate

Trevor Adams, Purchasing Department *Interviewer: Rich Handler 14 April 2003*

- Paper is the main form of solid waste. There is a lot of polystyrene consumed as packaging for the science departments. Paper is collected by Supercare. Printer cartridges are recycled
- Furniture is recycled for the whole of the University. It is used internally a number of times, before being sold externally.

Prof Michael James, Department of Anaesthesia *Interviewer: Rich Handler 11 April 2003*

- Paper is the main form of solid waste. Operating theatres produce ampoules, glass, and metal needles.
- The motivation to conserve costs and therefore resources means that little unnecessary waste is produced.
- Some obsolete medical equipment and computers are stored in the hospital, some of it is sent to landfill, and some is unaccounted for (Rich Handler addition: "unaccounted for" means that the person in charge of old equipment does not know what has happened to some of the old equipment).
- In offices printer cartridges are re-filled, and electronic communication is used as much as possible (instead of printing paper copies).
- Computer printing is not charged to individual users and therefore paper saving behaviour is not encouraged. For two years attempts have been made to set up such a system (Rich Handler addition: the reason for the lack of implementation seems to be technical know-how).
- In operating rooms, waste is disposed in separate bins for contaminated and non-contaminated waste.
- Gas cylinders are collected by the vendor and re-used. They are pressure tested every 10th use.

Camilla Colley, Earthlife Africa, UCT *Interviewer: Rich Handler 11 April 2003*

Awareness

- Aware of international precedent. Examples are: University of Vermont, University of Massachusetts (Amherst), Oberlin college, and Harvard. These universities have the purchasing power to buy environmentally beneficial products and bring down the price of these products.
- Aware of the EMWG, which has no student representation, Properties and Services Department and EcoServices.
- There is no list of environmental contacts for UCT where water leaks can be reported and other issues addressed.

Education

- Images and pictures are more effective for student education than words.
- Environmental literacy needs to be taught and could possibly be included in the first-year orientation programme.
- Performance art and short film are very good for education.
- Earthlife Africa is preparing a plan for environmental awareness focused on curbing individual consumption and encouraging anti-smoking and healthy lifestyle. Earthlife Africa UCT consists of 5 committee members and approximately 25 other members. The group is seeking to grow membership. Stellenbosch University also has Earthlife Africa group.

Solid Waste

- William Temmers at UCT Sport Centre had a contract with UCT to sell recyclable paper to Sappi.
- Printed material is purchased in bulk. Excess material that is dated is recycled.
- Earthlife Africa UCT would like to assist in a recycling programme for UCT. Wheelie bins that are labeled are needed for waste separation, similar to the Earthlife Africa (JHB) Zero Waste initiative at the World Summit for Sustainable Development.

Dudley Werner and Dr Herring, Department of Radiation Medicine

Interviewer: Rich Handler 5 May 2003

- Paper and disposable towels are the main forms of solid waste.
- There is no separation of waste for recycling purposes within the department. All waste is collected by hospital staff and taken to the A-floor of the new GSH Building. Apparently, paper is there separated for recycling (contact: Mr Harold Scott, Clinical Engineering).

Prof Anthony Black, School of Economics *Interviewer: Rich Handler 15 April 2003*

- Paper is the main solid waste. Other waste includes kitchen waste (tea bags) and printer cartridges.
- No separation of waste takes place. Printer cartridges from offices are re-filled (they cost 50% of the price of a new cartridge). Cartridges for high-volume, high-quality printers are purchased new and disposed.
- Computers are replaced approximately every 3 years. The Faculty of Commerce deals with the disposal of obsolete computers.

John Critien, Director of Properties and Services *Interviewer: Sandra Rippon 17 May 2003*

- We (P&S) are now able to learn from issues, mistakes at Natal and other institutions.
- John Critien has difficulty with the City Council waste management at a political level. City Council professes to have own it's own environmental policy. We know that the landfill sites are being depleted so we try to recycle, but there is no acknowledgement in terms of money. UCT pays about R1 million rand a year for waste disposal, irrespective of how much is dumped. A group of concerned companies has been formed, namely UCT, the V&A Waterfront, Century City, Grand West, who all recycle. It is believed that these companies are being unfairly treated. Whilst UCT have an association with these others, they have not chosen to go a legal route on this issue, as the others have. UCT is hoping to appeal at a political level. These groups are all desperately trying to contribute to environment improvement. This is a moral issue, which should be fought at a political level. The City Council's Environmental Policy supports recycling, but don't support people that recycle. UCT is only looking for a 50% reduction, for an equal share of the savings. The demand for landfill would fall if everybody started recycling. John Critien was able to influence the City Council in Durban and Pietermaritzburg for a reduction on that basis. Charges should be on a dump basis, however there is a minimum tariff, the same as water charge.
- The waste facility at UCT is an important issue. They found at Natal and Durban particularly, it became a learning facility for environmental students to look at waste. Money from the government from the new plastic bags may be available to set up educational places. This idea can be motivated to government by the fact that UCT can influence young minds.

Appendix C4: Environmental Law - Definitions, Principles and Legislation Applicable to Solid Waste Management at UCT

The generation of waste, pollution control and resultant consequences on people's health and environmental well-being raise a number of complex legal questions, usually entailing an intricate analysis of both the common law and knowledge of a plethora of statutory and regulatory provisions.[1] Waste minimization is not specifically legislated in South Africa at present.[2] There are, however, common law principles, legislation and overarching policies, which are relevant to waste minimization, and consequently to the management of solid waste at the University of Cape Town (UCT).

This section covers the legal definition of "waste" and "pollution", and discusses the common law, statutory and regulatory provisions and policies pertinent to solid waste management at UCT.

C4.1 Classification and Legal Definition of Waste

A clear-cut classification of waste and land pollution is not possible and therefore several approaches have been taken:[3]

- *Categorisation by activity*: for example, agricultural, industrial and incineration activities;
- *Categorisation by type:* hazardous/toxic waste or substances, liquid/solid waste, industrial waste, mining waste, domestic waste, agricultural waste, medical waste, nuclear waste, radiation, effluent, litter, sewage, and others;
- *Categorisation by effect:* for example on health or the environment.

The law does not fall neatly into any one of these categories but cuts across all of them.[4] Another problem when attempting to define "waste" is that one person's waste may be another's raw material.[5] The legal definition of commonly used terms such as "pollution" and "waste" is problematic.[6] As indicated above, it may be conceptually difficult to distinguish between waste as a resource or as a pollutant. The problem of definition must therefore be seen against existing law.[7]

According to the Environment Conservation Act (ECA) 73 of 1989, "waste" is defined as:

> any matter, whether gaseous, liquid or solid or any combination thereof, originating from any residential, commercial or industrial area or agricultural area identified by the Minister as an undesirable or superfluous by-product, emission, residue or remainder of any process or activity.[8]

The Minister in 1990 identified certain matter as waste:[9]

> For the purposes of the definition of 'waste' in section 1 of the Environment Conservation Act 1989 (Act No. 73 of 1989), I, Gert Jeremais Kotze, hereby identify 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 thereof, originating from any residential, commercial or industrial area, which –
>
> (a) is discarded by any person; or
>
> (b) is accumulated and stored by any person with the purpose of eventually discarding it with or without prior treatment connected with the discarding thereof; or
>
> (c) is stored by any person with the purpose of recycling, re-using or extracting a useable product from such matter, excluding –
>
> (iii) building rubble used for filling or levelling purposes.

Although the concept of pollution is problematic, it has been defined in the National Environmental Management Act (NEMA) 107 of 1998 as:

> any change in the environment caused by –
>
> (i) substances;

(ii) radioactive or other waves; or

(iii) noise, odours, dust or heat,

emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, 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 an effect in the future.[10]

The environment referred to in the above definition is itself defined in NEMA (1998) as:

the surroundings within which humans exist and that are made up of –

(i) the land, water and atmosphere of the earth;

(ii) micro-organisms, plant and animal life;

(iii) any part or combination of (i) and (ii) and the relationships among and between them; and

(iv) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.[11]

For the purpose of later references in this document it is important to note that a "disposal site" is defined in ECA (1989) as "a site used for the accumulation of waste with the purpose of disposing or treatment of such waste."[12] "Litter" means "any object or matter discarded by the person in whose possession or control it was."[13]

C4.2 Common Law Principles

Common law principles form the basis of current day law of neighbours and law of nuisance, which underlie contemporary South African law regulating waste management and pollution control.[14] The Roman Law maxim "*sic utere tuo alienum non laedas*," meaning one may use one's property in a way which does not harm another, forms the foundation of neighbour law. The principle that ownership does not imply unfettered use of property has relevance to all forms of waste management and pollution activities, whether causing dust, noise, odours, etc.

Nuisance law is typically linked to interdict proceedings where proof of fault is generally not required unless the interdict is accompanied by a claim for damages.[15] There are three distinct forms of nuisance:

(a) *public nuisance*, where an act or omission or a state of affairs impedes, offends, endangers or inconveniences the public at large;

(b) *private nuisance*, where an act or omission or condition or state of affairs materially inconveniences another in the ordinary comfortable use or enjoyment of land or premises;

(c) *statutory nuisance*, a condition or state of affairs which a legislative authority has declared to be a nuisance.[16]

The law of nuisance, in particular, has been extensively invoked in various forms of pollution generated on land.[17] The common law of neighbours and nuisance is pertinent to noise, odours and other forms of pollution which may arise from UCT's management of solid waste.

C4.3 International Law, Conventions and Protocols

In 2000 there were 26 international agreements (17 conventions, 4 protocols, 3 treaties, 2 agreements) pertaining to integrated waste management, 19 of which had been acceded to or ratified by South Africa. However, since the management of solid waste at UCT excludes toxic and hazardous waste, which is managed separately, the ratification of these agreements is not of significance to UCT.

C4.4 National Legislation

The following pieces of legislation are of relevance to waste minimisation and UCT's management of solid waste. They are discussed in separate sections below:

- The Constitution of the Republic of South Africa, Act 108 of 1996
- National Environmental Management Act 107 of 1998
- Environment Conservation Act 73 of 1989

4.4.1 The Constitution of the Republic of South Africa, Act 108 of 1996

In terms of the Bill of Rights (Chapter 2 of the Constitution), everyone has a right:

(a) to an environment that is not harmful to their health or well-being; and

(b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that –

i. prevent pollution and ecological degradation;

ii. promote conservation; and

iii. secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.[18]

Although waste minimization and land pollution are not specifically mentioned, the state has a duty to ensure that waste management and pollution laws are enacted to *inter alia* "prevent pollution" and "promote conservation", and by implication a duty also to ensure that these laws are effectively applied and implemented.[19] Statutory bodies therefore have an obligation to promulgate legislation to give effect to this right.

The University of Cape Town is subject to the promulgated legislation. NEMA (1998) is the framework legislation which converts the constitutional environmental right into a more concrete reality.[20] Many of the principles of NEMA therefore have direct bearing on the manner in which solid waste management should be conducted at UCT.

4.4.2 National Environmental Management Act 107 of 1998

Section 2 of NEMA (1998) lays down a number of principles that, by implication, should be incorporated into the practice of solid waste management at UCT:

- That pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;[21]
- That waste is avoided, or where it cannot be altogether avoided, minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner;[22]
- That the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource;[23]
- That the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised;[24]
- That a risk averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions;[25]
- Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle;[26]
- Community well-being and empowerment must be promoted through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate knowledge;[27]

- The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage;[28]
- 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;[29]
- The vital role of women and youth in environmental management and development must be recognised and their full participation therein must be promoted.[30]

4.4.3 Environment Conservation Act 73 of 1989

NEMA (1998) superseded much of the ECA (1989). However, the sections that *inter alia* cover the prohibition of littering (S 19), waste management (S 20), and the identification and prohibition of activities which have a detrimental effect on the environment (S21 & 22) still stand. For example, the Minister may make regulations with regard to waste management, concerning:

> (c) the classification of different types of waste and the handling, storage, transport and disposal of such waste;
>
> (e) the utilization of waste by way of recovery, re-use or processing of waste.[31]

C4.5 White Papers, National Waste Management Strategy and the Polokwane Declaration

4.5.1 White Paper on Integrated Pollution and Waste Management for South Africa

The White Paper on Integrated Pollution and Waste Management for South Africa (IP&WM; 2000) represents a paradigm shift from dealing with waste only after it is generated (ie. "end of pipe") towards:

- pollution prevention
- waste minimisation
- cross-media integration (air, land, water)
- involvement of all sectors of society in pollution and waste management.

General techniques to achieve pollution prevention and waste minimisation will include, *inter alia*: policy and regulation, technical assistance and compliance monitoring, efficient use and conservation of natural resources, reuse and recycling, operating efficiencies, and economic incentives and disincentives.

The overarching principles of this White Paper are those of the Constitution (Bill of Rights) and NEMA. Thus the Duty of Care Principle has been adopted which states that:

> Any institution which generates waste is always accountable for the management and disposal of this waste and will be penalised appropriately for any and every transgression committed.[32]

4.5.2 White Paper on Environmental Management Policy for South Africa

The White Paper on Environmental Management Policy (EMP) for South Africa delineates government's policy on environmental management. The IP&WM is a subsidiary and supporting policy to this environmental management policy. One of the objectives of the policy is:

> *To set targets to minimise waste generation and pollution at source and promote a hierarchy of waste management practices, namely reduction of waste at source, reuse and recycling with safe disposal as the last resort.*

4.5.3 National Waste Management Strategy and Action Plans

The National Waste Management Strategy and Action Plans (NWMS&AP; 1999) presents a long-term plan for addressing key issues, needs and problems experienced with waste management in South Africa.[33] The core objective of the NWMS&AP is to integrate pollution and waste management and so

move away from fragmented and uncoordinated waste management. The envisioned integrated approach extends over the entire waste cycle from "cradle to grave", and covers the prevention, generation, collection, transportation, treatment and final disposal of waste.

4.5.4 White Paper on Education and Training (1995)

The White Paper on Education and Training (E&T; 1995) states that:

> The importance of environmental education, involving an interdisciplinary, integrated and active approach to learning, must be a vital element of all levels and programmes of the education and training system, in order to create environmentally literate and active citizens and ensure that all South Africans, present and future, enjoy a descent quality of life through the sustainable use of resources.[34]

4.5.5 The Polokwane Declaration on Waste Management

The Polokwane Declaration on Waste Management arose out of the first National Waste Summit, hosted by the Department of Environmental Affairs and Tourism and held in Polokwane, September 26-28, 2001. Representatives of government at national, provincial and local level, civil society and business community participating in the summit recognised the need for urgent action to reduce, reuse, and recycle waste in order to protect the environment and that waste management is a priority for all South Africans.

The goal was set to stabilize waste generation and reduce waste disposal by 50% by 2012 and develop a plan for zero waste by 2022. The participants reaffirmed a commitment to the Integrated Pollution and Waste Management Policy, the National Waste Management Strategy and the principles of waste minimization, reuse and recycling for sustainable development.

Furthermore the Polokwane Declaration says that government, business and civil society need to join in common efforts toward the accomplishment of the above goal and engage in the following actions:

1. Prioritisation of waste management,
2. Implementation of the National Waste Management Strategy,
3. Development and implementation of a legislative and regulatory framework to promote waste avoidance, prevention, reduction, reuse and recycle,
4. Provision of efficient and effective collection and disposal facilities,
5. Establish and enforcement of targets for waste reduction and recycling,
6. Setting benchmarks towards achieving the 2012 target,
7. Disseminate information on the status, trends and waste reduction projects in the country,
8. Introduce mandatory waste audit processes,
9. Explore the use of economic instruments to support waste management initiatives,
10. Develop and provide the public with educative resources necessary to allow participation in the waste elimination process on an informed basis,
11. Develop intergovernmental capacity,
12. Develop waste information and monitoring systems,
13. Establish systems that ensure that physical and financial responsibility for waste is borne by the product producers,
14. Effective manage waste disposal/reprocessing facilities, thereby avoiding the need to establish new, or expand existing facilities,
15. Promote employment and economic empowerment opportunities, in particular in Small, Medium and Micro Enterprises, through increased product reuse and material recycling,
16. Promote clean technology and clean production.[35]

Summary Box

Pertinent Points: Environmental Law

- **Waste Minimisation** is not specifically legislated in South Africa.
- **Legal definition** of commonly used terms such as "pollution" and "waste" is problematic. One person's waste may be another's raw material.
- **Common law** of neighbours *"sic utere tuo alienum non laedas"* and nuisance is pertinent to noise, odours and other forms of pollution which may occur from the management of solid waste.
- **Environmental Right** in the Constitution: Everyone has a right to an environment that is not harmful to their health or well-being; and to have the environment protected through the prevention of pollution and promotion of conservation.
- **Waste Minimisation Principle** in NEMA, IP&WM, EMP and NWMS&AP : Waste is to be avoided (ie. prevention), or where it cannot be altogether avoided, minimised (ie. reduction) and re-used (ie. re-use) or recycled (ie. recovery) where possible and otherwise disposed of in a responsible manner (ie. disposal).
- **Polluter Pays Principle** in NEMA and IP&WM: The costs of remedying pollution, environmental degradation, consequent health effects....must be paid for by those responsible for harming the environment; and the environment includes the aesthetic and cultural properties and conditions...that influence human health and well-being.
- **Cradle to Grave Principle** in NEMA and NWMS&AP: The responsibility for the environmental health and safety consequences of a policy, programme, project, etc. exists throughout its life cycle.
- **Environmental Education Principle** in NEMA and E&T: Community well-being and empowerment must be promoted through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate knowledge.

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[1] Glazewski, J. (2000) *Environmental Law in South Africa*, Butterworths, Durban, p630.
[2] Department of Environmental Affairs & Development Planning (2003) A Waste Minimisation Guideline Document for Environmental Impact Assessment (EIA) Reviews, Prepared by Common Ground Consulting and deVilliers Brownlie Associates, DRAFT, pA-2.
[3] Glazewski, J. (2000), p671
[4] Glazewski, J. (2000), p671
[5] Glazewski, J. (2000), p672
[6] Glazewski, J. (2000), p672
[7] Glazewski, J. (2000), p672
[8] Environment Conservation Act 73 of 1989, Section 1 (S 1) (xxii)
[9] GN1986 in *Government Gazette* No. 12703 dated 24 August 1990
[10] National Environmental Management Act 107 of 1998, Section 1 (S1) (xxiv)
[11] NEMA (1998), S 1 (xi)
[12] Environment Conservation Act 73 of 1989, Section 1 (S 1) (vii)
[13] ECA (1989), S 1 (xiv)
[14] Glazewski, J. (2000), p12
[15] Glazewski, J. (2000), p650
[16] Milton, JRL. *The Law of South Africa* (LAWSA) Vol 27 par 110, cited in Glazewski, J. (2000), p649
[17] Glazewski, J. (2000), p679
[18] The Constitution of the Republic of South Africa, Act 108 of 1996, Section 24 (S 24)
[19] Glazewski, J. (2000), p678
[20] Glazewski, J. (2000), p678
[21] NEMA (1998) S 2, (4)(a)(ii)
[22] NEMA (1998) S 2, (4)(a)(iv)
[23] NEMA (1998) S 2, (4)(a)(v)

[24] NEMA (1998) S 2, (4)(a)(vi)
[25] NEMA (1998) S 2, (4)(a)(vii)
[26] NEMA (1998) S 2, (4)(e)
[27] NEMA (1998) S 2, (4)(h)
[28] NEMA (1998) S 2, (4)(o)
[29] NEMA (1998) S 2, (4)(p)
[30] NEMA (1998) S 2, (4)(q)
[31] ECA (1989) S 24 (c) and (e)
[32] White Paper in on Integrated Pollution and Waste Management for South Africa, in *Government Gazette* No. 20978 dated 17 March 2000
[33] National Waste Management Strategy and Action Plans, Version D dated 15 October 1999
[34] White Paper on Education and Training, 1995
[35] The Polokwane Declaration on Waste Management, Department of Environmental Affairs and Tourism, Polokwane, 26-28 September, 2001.

Appendix C5: Waste Minimisation Practices at Other Universities

C5.1 Waste Minimisation at Some South African Universities

University	Information of Interest
Rhodes University (RU)	• Waste management is left up to departments and divisions to participate in the programme. • RU has an Environmental Policy but not a Waste Policy. • An external company recycles an estimated 35% of all paper and cardboard. • The recycling materials are collected from site and taken to a private sorting facility. • Kitchen waste goes to a pig farmer. • Organic waste is composted. • Current computer policy is to roll down older units from the modern labs to offices etc and then out into the community to schools and NGO's. • Shredded confidential paper is currently supplied to a funeral parlour for "bedding" for coffins. • There are a number of private initiatives that are taking place at present from student groups as well. The current initiative is a project to collect waste paper from the residences and send for recycling. They have ordered WOW bins for collection in the residences and arranged with a contractor to collect the material for shipment.
University of Natal (NU)	• Over many years there have been efforts to promote an ethos of "Reduce, Reuse, Recycle". • Active paper recycling programme. In 1998 was placed second (Service Category) in the Institute of Waste Management/EnviroServe Waste Minimisation awards. • The paper recycling programme, in the University's newly named Nelson R. Mandela School of Medicine, has been a great achievement. A Recycling Fund has been established (current value is approximately R17 000) with income generated from selling waste paper and used cartridges, which students can access as short-term loans, to prevent them running into financial difficulties. • Individual staff members or departments either refill printer and photocopy/fax cartridges or sell them to various companies for refilling. • All waste is sorted sorts into recycable and non-recyclable material. Since this project began the percentage of recycled waste has remained at 80% or above.
University of Stellenbosch	• Cans are recycled. All staff and students are encouraged to participate in and be responsible for this project. A green 200 l Waste Tech drum with a lid is used for the collection of cans. Once this drum is full recycling people empty the contents. The cans fetch 20 cents per kilogram. • Paper waste is collected in yellow rubbish bins supplied to each lab. • Each lab is responsible for paper recycling in their lab. 2 X 200 liter green Waste Tech drums are used for paper recycling. Each drum is a storage space for a different class of paper: *Class 1*: White printer paper, light colored paper as well as used books without covers generate 40 cents per kilogram and *Class 2*:Cardboard generates 20 cents per kilogram The different classes of paper must not be mixed. Drums are labeled for ease of use.
University of the Western Cape (UWC)	• There is no formal recycling initiative at UWC. • Solid waste is currently removed and taken to landfill. • Some recycling is carried out by the cleaners who collect office paper and AA Waste buys it from them. • UWC does not have a Waste Policy or an Environmental Management Plan.

C5.2 Waste Minimisation at Some Overseas Universities

5.2.1 Auburn University, Alabama, USA[1]

- An aggressive **waste minimization programme** helped to instill sound environmental values in students, who will carry these values into their future endeavours.
- **Waste minimization training** programmes were conducted for the entire campus along with targeted training for individual departments whose waste generation appears above the norm.
- The **waste minimization plan** incorporated the entire congressional hierarchy of the campus, starting with upper administration down to the student level.
- During the planning and organization phase of the waste minimization programme the established goals were not simply qualitative but were measurable and quantifiable. They were achievable, suitable and acceptable to both university and regulatory agencies, and flexible to changing requirements.
- The waste minimization plan was time specific, and was to be reviewed on a quarterly basis to find out waste trends.
- The waste minimization programme recognized that the problems of a research and educational institution are different from that of industries. Management structures of universities do not lend themselves to the more centralized decision-making found in industries. While decentralization facilitates academic independence, a decentralized approach poses several obstacles to the complete tracking of the inputs to the system.
- A process flow diagram for data collection was established and important steps in waste generation were identified. The largest waste stream to be targeted for minimization first was identified. In this process of prioritizing waste streams for minimization other factors such as human health and safety, environmental health, applicable regulations and the probability of success were considered.

Lessons For UCT

- Have a broad-based waste minimization program – from top management to student level
- Set specific targets to be achieved in a specific time frame
- Identifying the largest waste streams helps to concentrate efforts on the waste that could be have significant effect when targeted

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5.2.2 Bowdoin College, Maine, USA[2]

Refillable Mugs

- Since 1990 Bowdoin College has managed a very successful refillable mug program.
- The Dining Service distributes, during Orientation Week, a free thermal mug to each first-year student. The red and white mugs are now decorated with the Dining Service logo and cost Bowdoin College roughly $500 each semester (500 students x $1.00 per mug.)
- Since establishing the refillable mug program in 1990 Bowdoin College have given each student a refillable mug and, as a result, experienced a steady decline in paper cup usage. Over 2.5 million cups have been diverted from landfill since the fall of 1990—this translates to a gross savings of over $45,000 in paper cup costs alone.
- Perhaps most importantly, since the program's conception Bowdoin College has experienced a heightened awareness of disposables usage by students, faculty and staff.
- Mugs are also available for sale to faculty and staff.

Composting Program

- Pre-consumer food scraps (fruit and vegetable trimmings for the most part) are collected in the food preparation areas and put into four 55-gallon plastic garbage cans labeled for food scraps. Each can has a tightly-fitting lid and bungy cords to prevent animals from getting to the contents. The staff weighs each bag before putting it in the appropriate can, and records the weights and other necessary information on a data sheet.

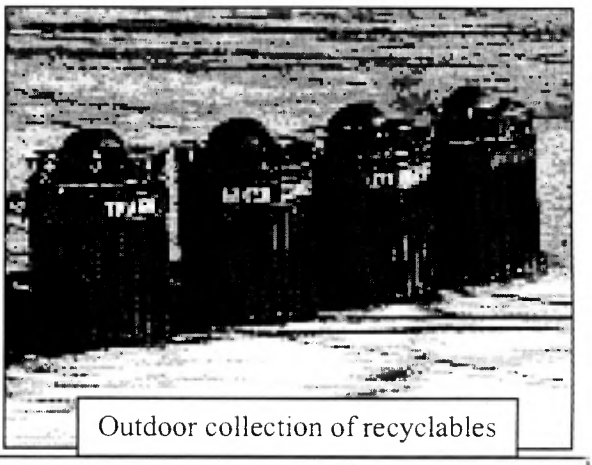
- The benefits of composting were three-fold for Bowdoin College:
- Composting has environmental benefits, as it reduces waste stream and thus reducing the amount of material which the College sends to the landfill.
- Composting is not only economically viable, but it is likely to save money. This program is estimated to save the College up to $1600 annually by reducing landfill fees.
- Promoting composting and recycling is found to be good for community relations.

Lessons For UCT

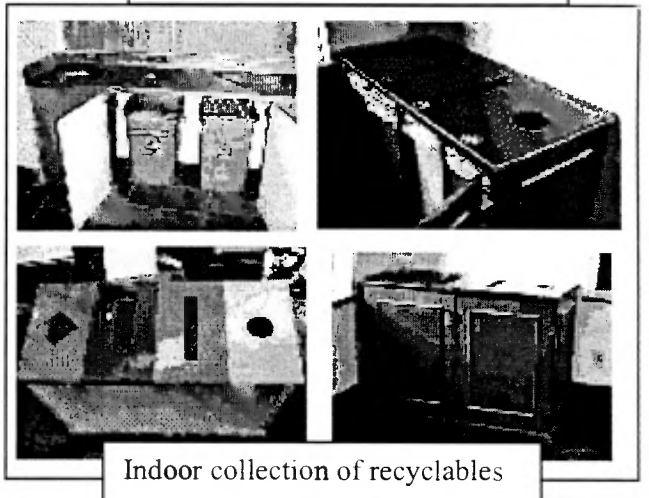
- Refillable mugs can prevent production of paper or polystyrene cup waste.
- Recycling of food waste has obvious environmental benefits and it reduces landfill fees.

5.2.3 Brown University, Rhode Island, USA [3]

Recycling program at Brown University encompasses 86 office buildings, 41 dormitories, and 70 rental properties. During the regular school year approximately 6700 students (of which 4300 live in Brown-owned dormitories or buildings) and 2900 University employees participate in the program. Total solid waste generated is approximately 3500 tons per year.



Outdoor collection of recyclables



Indoor collection of recyclables

Materials that are recycled in the program include: corrugated cardboard, white paper, mixed office paper, newspaper, glass bottles, limited types of plastic bottles, food waste, yard waste, wood waste, automobiles, appliances, vehicle batteries, laser printer toner cartridges, used lubricating oil, telephone directories, and scrap metals.

Dormitories

In the dorms, each room is provided with a white bucket in which recyclables can be collected. It is the students' responsibility to separate the contents of the white buckets into larger bins that are placed at centralized locations in all of the buildings. **Yellow** 44-gallon bins are used for the mixed containers, **red** 32-gallon barrels for newspaper, and **blue** 44-gallon bins for mixed office paper. These bins are lined with **clear** plastic bags so that the recyclables can be clearly identified once they are removed from the bins. Twice a week, the custodians of each building move the bagged recyclables outside, where they are picked up by a contracted waste hauler. Near the end of each semester, collection areas and containers for reusable clothing and durable goods are set up near the dormitories and these items are distributed to community support organizations.

Food Services

Food waste from the University cafeterias are stored in 55-gallon drums and collected daily by a local pig farmer. Grease and meat trimmings are also stored in 55-gallon drums and hauled away to make livestock feed and soap. Reusable mugs are sold at the campus snack bars, and their use is encouraged through price reductions on items such as soft drinks when the mug is used instead of a disposable cup.

Publicity and Education

Publicity and education were vital to the program's success. Information concerning how and what to recycle are distributed to every first year student upon their arrival at Brown. Furthermore, outreaches are conducted

in all first year dorms that explain the recycling program to the students and act as a forum for questions. Posters near containers, electronic bulletin boards, and periodical advertisements in the student newspaper encouraged participation. Clearly marked containers are placed in stations in strategic locations throughout campus.

Lessons For UCT

- Recycling involves the student body and university employees
- One container is available in each room in the dormitories for collection of recyclables, which is emptied into 3 different containers in the corridor – one for general waste, one for newspapers, and one for mixed office paper.
- Reusable mugs are sold at the campus snack bars, and their use is encouraged through price reductions on items such as soft drinks when the mug is used instead of a disposable cup.
- Information concerning how and what to recycle are distributed to every first year student upon their arrival at Brown.
- Excellent publicity and education programs.

5.2.4 Connecticut College, USA[4]

Connecticut College's recycling system is a continuous evolution of process and education. To function as intended, the system depends on the understanding and efforts of everyone from waste generators, to the custodians who collect the materials, to the grounds workers who pick up the recyclables from outside buildings.

The recycling programmme encompasses 22 residential buildings and 25 academic and public buildings. Faculty, staff members, and students take part in the program. Three factors have player a role in reducing the college's total weight of trash and in increasing the percentage of material recycled. These are:

- the concerted efforts to educate the campus
- diverting useful material from the waste stream, and
- providing adequate recycling receptacles

Residence Halls

In each of the 22 residential areas, dorm rooms are furnished with two containers—blue for office paper and gray for newspapers and magazines. Each floor of each hall has at least one central recycling location where students are expected to divide their trash and recyclables as instructed by labels on the containers and by permanent signs above them. These are trash barrels, a rectangular blue bin for bottles & cans, a 30-gallon gray barrel for newspaper and magazines and a 20-gallon blue barrel for office paper. Corrugated cardboard and bags of Styrofoam packing material are placed neatly beside these stations for recycling.

Public Buildings

In office buildings there are not standardized large container recycling stations in all locations. Instead custodians empty the 14-qt. paper containers at people's desks.

Collection

Custodians collect the materials from the central locations where they are sorted. The two types of paper go into tall brown bags, and are labeled with a marker. Bottles & cans and trash are both transported in **clear** plastic bags. Custodians collect all the materials daily and place them in the trash rooms in the basement or outside of the building. These are picked-up 3 days a week and recycled daily. Paper is collected and taken to a site on campus where bags are divided into the two grades. There is a 3 cubic yard dumpster for office paper, where bags are emptied out, and a 45 cubic yard trailer for newspapers and magazines. There is also a cardboard compactor at that site. All of this paper material is picked up as needed by an external paper company. Styrofoam packaging material is taken by another company and reused.

Public Awareness and Education

Education is an essential component of the recycling program at Connecticut College, and is attributed for the increased rate of recycling and decreased percentage of overall waste seen in recent years. All members of the college receive simple instructions on what to recycle. These instructions are copied on the back of old letterhead to avoid wasting paper. Student recycling interns (these are paid students who help the environmental coordinator to monitor the recycling system, inventory and deliver bins and disseminate education materials) put up brightly coloured laminated signs above the central receptacles for office paper, newspaper and magazines, bottles & cans and non-recyclables. House Environmental Coordinators in each of the residence halls talk with their neighbors about why, how and what to recycle.

Lessons For UCT

- Students, faculty as well as staff members take part in the recycling programme.
- Education and providing adequate recycling receptacles reduces total waste and increases the percentages of materials recycled. Everyone receives simple instructions on what to recycle.
- Placing different containers in dorm rooms helps students become more recycling conscious.
- The Recycling process does not pass through a middleman.
- Brightly coloured laminated signs put up above the central receptacles for office paper, newspaper and magazines, bottles & cans and non-recyclables.

5.2.5 Leeds Metropolitan University, UK[5]

Leeds Metropolitan University (LMU) developed an environmental purchasing policy, which has driven a number of 'greener' contracts. One of these is the contract to print the university's prospectus. The tendering process for this highlighted the environmental and economic benefits of reducing the weight of paper and changing the production process from sheet-fed to web-fed. These were found to be capable of producing a similar level of environmental improvement to shifting to recycled paper, which had raised some quality concerns.

The shift to web-based printing has already produced a 13% cost reduction and reduced enery consumption. A planned 10% reduction in paper weight for the 2004 prospectus is also expected to cut printing costs by £2,500 (with additional savings from reduced postage costs) and reduce paper use by 5 tonnes per annum.

The purchasing policy has two main aims:

- To highlight environmental issues to buyers and ensure that they give them proper consideration when making procurement decisions
- To encourage suppliers to improve their environmental performance.

LMU's purchasing and environmental staff believe that it has helped to stimulate a number of environmentally positive purchases since its inception including:

- Buying Energy Star compliant double-sided photocopiers
- Furniture suppliers becoming accredited to ISO14001
- Raising the percentage of recycled paper to 10% of total paper purchase

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Lessons For UCT

- Have an environmental purchasing policy
- Environmental criteria can highlight different options for meeting purchasing requirements – which can sometimes create economic as well as environmental benefit
- Moving to recycled paper is not the only means of achieving environmental improvement in document purchases – changing production processes and/or reducing the weight of paper can deliver comparable environmental benefits and also reduce costs

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5.2.6 Middlebury College, Vermont, USA[6]

Recycling

The recycling program at Middlebury College consists of a full time staff recycler, approximately 70 student hours per week during the normal academic year, and a supervisor. The service is a student-oriented program. Middlebury College diverted 61% of the waste stream to recycling and composting during 1998.

Materials are collected in two bins. The first bin is for all waste paper. This includes all white and colored office paper, envelopes, post-it notes, boxboard, cardboard, magazines, newspapers, books – hard and soft covered, shredded paper, and almost any other paper product. The most common exceptions are waxed or carbon papers, potato chip bags, or any plastic coated paper. The second bin is for glass, tin and plastic. Students are reminded to rinse all of these containers prior to placing them in the bin. Cardboard is broken down, baled and stacked next to the recycling bins for collection. Mixed paper, plastics, and steel/tin are also baled. Finished bales are stored in tractor-trailer boxes and then delivered to market.

Middlebury Recycling employs about 16 students each semester. The work is a good way to gain experience in an environmentally oriented job, earn money, and help keep the College at the cutting edge of recycling. Two positions are hired at the beginning of each semester: recycling collector, responsible for gathering the bags of recycling from the buildings and take them to the Recycling Center on campus, and recycling sorter, who work with full-time employees and are responsible for sorting through the bags of recycling and divide them into marketable categories.

Lessons For UCT

- The two-bin system is simple and easier for students to adopt.
- Students can be employed in the recycling program. This has major educational implication for students.

5.2.7 University of Derby, UK[7]

The University currently recycles the following:

- Computers
- Paper and cardboard
- Glass bottles and jars
- Aluminium cans
- Toner cartridges
- Flourescent tubes

The costs of waste disposal are allocated to the departments that are responsible for generating the waste in the first place, thereby giving them a financial incentive to minimize.

Reuse: Computers, Envelopes and some Paper

The University of Derby aims to re-use computers rather than recycle them. About 40 machines are sent to Cuba. Another 60 PC's were donated to the Rotary Club for distribution to schools. Desolate equipment is refurbished and tested for electrical safety. They are then distributed where they are most needed. The University has donated 36 computers to the University of Plodiv in Bulgaria to help its students advance their IT skills. In donating these machines the University of Derby is promoting re-use and showing good practice by not simply sending them to landfill. Although the computer specifications are no longer high enough for the technology in the University of Derby they are perfectly usable in Plodiv.

The University re-uses envelopes internally, in some departments paper is re-used for scrap message pads.

Recycling: Paper

Derby University has a list of Do's and Don'ts in its website. This is meant for education purposes to guide students and staff to put the right paper in the right bags for recycling. The University adopted four recycling

units from the council and placed them on some of the Halls of Residence to promote recycling amongst the students and the general public in the area.

- Normal paper (stationary paper) goes in green bags normally situated in the paper stations.
- Computer paper (triple invoice paper & Dot Matrix paper) goes in blue bags.
- Confidential paper (to be shredding) goes in pink bags.

Total savings from recycling of paper at the University of Derby was £2,493 in 1998 and £4,083 in 1999.

University of Derby Waste Guidelines

These guidelines have not been formally adopted by the University of Derby but are used within its Estates department to shape its waste minimization initiatives.

- The University will reduce waste arising from its operations and implement good waste management practices using the "cradle to grave" approach.
- The University will reduce its consumption of materials whenever practicable and encourage and enforce reuse and recycling by its staff and students.
- The University will encourage the use of Electronic communication where possible discouraging the printing of E-mails.
- Where practicable buy and promote the use of environmentally friendly products. This would mean avoiding using non-renewable resources or products that are polluting in their production and use. Trying to purchase items with minimal packaging and ensuring that the product is durable and repairable.
- Compost the organic waste and reuse on residential sites.
- If disposal is the only option left then the University will ensure that the Best Practicable Environmental Option (BPEO) is used.
- Encourage all staff and students to help in the implementation of this policy.

Lessons For UCT

- A waste policy / guidelines could help UCT to manage its waste more efficiently
- Allocating waste disposal costs to the department that are responsible for generating the waste in the first place gives them a financial incentive to minimize.
- Donating old computers to schools or disadvantaged communities
- Bags with different colours (blue, green and pink) makes it easy to place your paper waste in

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5.2.8 University Of Michigan, USA[8]

Waste Audits

A questionnaire with specific questions was developed to assess the quantities of the different waste streams generated at, and the procurement policy of, the University of Michigan. These were investigated in three categories: general solid waste, food waste and procurement policy. The questions in each category were the following:

Solid Waste

- How much total solid waste does your campus generate annually? (This may need to be broken down by dorms, departments, administration, etc.)
- For the ____ year, how much was landfilled?
  - How much was incinerated?
  - How much was recycled?
  - How much was composted?
- Who is in charge of solid waste disposal contracts?

- How many tons of each material, if any, does your campus recycle for the ___ year?
  - White paper _____ newsprint _____
  - colored paper _____ glass _____
  - computer paper _____ aluminum_____
  - cardboard_____ other___ ____ _____
- What were the costs of solid waste disposal for _____year?
- What was the cost of the recycling program?
- As a result of recycling how much have disposal costs decreased?
- What percentage of the total waste stream is garden waste? Are landscape clippings mixed or kept separate form other campus wastes? Does your campus use landscape clippings as compost or mulch?
- What percentage of the total waste stream is food waste? Is food waste kept separate from other campus waste? Is it composted?
- Please describe any programs your campus has implemented to promote source reduction.

Food

- Who operates campus food services?
- Who is responsible for making decisions about menu planning?
- What are your food services' purchasing criteria? What kind of food items are purchased, when, in what volume and at what cost?
- To what extent does your campus buy from local producers and processors?
- Do your food services purchase any certified organic produce, dairy or meat products?
- What is the current practice for disposing of food waste? Have any food recovery or food compost programs been initiated?
- Have food services discontinued the purchase of any food products for environmental reasons?

Procurement Policy

- Does your campus buy recycled paper?
- What types of recycled paper does your campus purchase?
- What is the price difference between recycled and non-recycled paper?
- How many tons of high-quality paper did your campus purchase for the _____year?
- What programs and policies have been established on your campus to promote the use of ecologically sound products?
- Does your campus purchase other recycled products such as oil or tires?
- Does the campus, one or more departments, or student association/governments have a policy of preferentially buying products made from recycled materials instead of virgin materials? Please describe the policy.

Benefits of the Audit

- by providing a baseline of data for comparison with future data, the audit served as a tool for measuring reductions in waste generation
- highlighted the strengths and weaknesses of the campus' current environmental management scheme
- increased the credibility of the waste minimization project
- aided the waste minimization group in gaining support from administrators, faculty, students, and staff for the group's future initiatives
- assisted in forming networks of individuals who are interested or involved in waste reduction
- served as a means of fostering public involvement. While collecting data, the team members were able to educate staff about pollution prevention. They were also able to gauge the level of interest or enthusiasm for different source reduction projects.

Barriers to the Audit

Two major obstacles hindered the data collection team: decentralization and scheduling difficulties. Because

of the decentralized nature of the University of Michigan (typical of large research universities), it was occasionally difficult to identify the person who holds critical information. Also, staff members had many other time commitments and it was therefore necessary for the team to make their schedule flexible in order to obtain the needed information.

Guiding Criteria for decision-making

After completing the audit, the team assembled to evaluate the data. This helped the team to target particular waste streams for demonstration projects. The first step was to eliminate those streams that appeared to have little chance for successful intervention. The following questions served as guiding criteria during the decision-making process:

- Do the numbers suggest that the waste stream is "significant"?
- Is intervention feasible given our short time line?
- Were the contact people easy to work with?
- Did contact people express interest in the audit team project and goals?
- Does there seem to be interest and support from the University administration in targeting this waste stream?
- What are the University's policies regarding this waste stream?
- Is this area too politically sensitive to allow for a meaningful intervention?

Lessons For UCT

- Audits are the initial step to conduct a waste minimization program
- Ask specific questions with regards to solid waste, food waste, and procurement policy
- Set goals that are achievable and target the largest waste stream

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5.2.9 University Of New Hampshire, USA[9]

The composting programme at the University of New Hampshire (UNH) demonstrates a viable and effective alternative to adding food waste to the wastewater stream and the landfill. In addition, composting results in a finished product which completes the food cycle. A food pulper is used to reduce the whole food waste into small bits and removes the water. This speeds the rate of decomposition.

Student interns pick up pre-consumer food waste three times a week. The food waste is taken to a farm and added to one of eight compost piles called windrows where the compost process begins. After about a year the composting process in the windrow is complete. The finished product is a nutrient rich soil amendment, and is used in place of chemical fertilizers to improve soil quality. Every spring, the farm sells the compost to area gardeners and farmers. Compost used as fertilizer improves the nutrient level, water holding capacity, and texture of the soil.

Lessons For UCT

- Composting is done in collaboration with a private farm.

5.2.10 University Of Waterloo, Ontario, Canada[10]

Highlights of Waste Reduction Activities at the University of Waterloo Campus:

Campus-wide

- keep all appropriate records on computer disk, not in paper copies
- circulation and posting of information instead of multiple copying
- limits imposed on posters for student elections

- 1000's of white and blue boxes for paper and books.
- reduce paper by using both sides of the paper, smaller print and/or single spacing

Purchasing Department

- vendors requested to take back packaging materials on large orders
- contracts reviewed for recycled-content products, that is, computer paper, exam booklets, forms, envelopes
- contracted for laser and ribbon cartridge recycling
- purchase re-manufactured laser cartridges
- boxes and shipping/packaging materials reused
- suppliers asked to deliver goods without packaging or in returnable, reusable containers instead of cardboard boxes
- purchase two-sided copiers

Food Services

- no styrofoam cups used at coffee shops
- better value offered for beverages when using own mug across campus
- single-use disposable cups, plates and cutlery replaced with reusable items

The environmental policy at the University of Waterloo has led to a waste reduction of 48% since 1987; 30% less in disposal costs than what they paid in 1998; elimination of polystyrene from student coffee shops, custodial participation in recycling of aluminum, glass, newsprint inside buildings and a monthly sale of surplus furniture and equipment.

Lessons For UCT

- Target waste reduction before dealing with recycling
- Much of the waste generated on campus can be reduced through sound purchasing policy, which is re-evaluated regularly

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6.2.11 Western Michigan University, USA[11]

Trash-to-treasure Program

Clothing, food, linens, toys, furniture, appliances, and toiletries are collected for the relatively less fortunate people. As the old saying goes "One man's trash is another man's treasure!" Each year boxes are set out for items that are fit for donation, collected throughout the week and taken to the poorer communities.

Recycling Around Campus

WMU has recycling available in all buildings on campus in 3-bin clusters. Each cluster contains a bin for paper products, another for glass, plastic (#1 and #2 bottles and jugs only) and metal and a third bin for trash. There are clear instructions as to what to throw into these bins. The recycling program receives largely supported from the university community, enabling WMU to reduce the amount of waste sent to landfill.

Waste Reduction Tips

WMU gives the following tips on its website to inform its staff and students about how they can reduce the waste they generate, such as "Edit on screen instead of on paper", "Use reusable mugs instead of Styrofoam", "Print double-sided copies when you have to print something out," and "Circulate electronically if possible." And "Course packs should be printed using both sides of the paper. Students: Encourage your professors to use both sides of the paper for handouts and course packs. This saves trees AND money!"

Lessons For UCT

- Donating trash not only benefits disadvantaged communities but also is a way to cut down on the quantity of waste that is landfilled
- 3-bin system is simple and manageable for students in separation of waste at source
- Waste reduction tips on website helps the raise students and staff awareness of waste minimization.

Summary of lessons that UCT can learn from other universities:

- Have a broad-based waste minimization program – from top management to student level
- Set specific targets to be achieved in a specific time frame
- Identifying the largest waste streams helps to concentrate efforts on the waste that could be have significant effect when targeted
- Refillable mugs can prevent production of paper or polystyrene cup waste
- Recycling of food waste has obvious environmental benefits and it reduces landfill fees
- Recycling must involves the student body and university employees
- Reusable mugs can be encouraged through price reductions on items such as soft drinks when the mug is used instead of a disposable cup
- Information concerning how and what to recycle are distributed to every first year student upon their arrival at UCT
- Excellent publicity and education programs are needed to drive the programme
- Education and providing adequate recycling receptacles reduces total waste and increases the percentages of materials recycled
- Placing different containers in dorm rooms helps students become more recycling conscious
- Have an environmental purchasing policy
- Environmental criteria can highlight different options for meeting purchasing requirements – which can sometimes create economic as well as environmental benefit
- Moving to recycled paper is not the only means of achieving environmental improvement in document purchases – changing production processes and/or reducing the weight of paper can deliver comparable environmental benefits and also reduce costs
- The two-bin or three bin system is simple and easier for students to adopt than something more complex.
- Students can be employed in the recycling program. This has major educational implication for students
- A waste policy / guidelines would help UCT manage its waste more efficiently
- Allocating waste disposal costs to the department that are responsible for generating the waste in the first place gives them a financial incentive to minimize
- Old computers can be donated to schools or disadvantaged communities
- Audits are a vital step to conduct a waste minimization program
- Set goals that are achievable and target the largest waste stream
- Target waste reduction before dealing with recycling
- Much of the waste generated on campus can be reduced through sound purchasing policy, which is re-evaluated regularly
- Waste reduction tips on UCT's website helps the raise awareness of students and staffs towards waste minimization

[1] http://www.auburn.edu/administration/safety/Waste_Minimize.html
[2] http://www.bowdoin.edu/dining/information/environmental.shtml
[3] : http://www.brown.edu/Departments/Brown_Is_Green/waste/recysum.html
[4] http://camel2.conncoll.edu/ccrec/greennet/Recycling_Information/recycling_information.html
[5] http://www.lmu.ac.uk/fin/envmnt/index.htm

[6] http://www.middlebury.edu/%7Erecycle/compreport.html
[7] http://www.derby.ac.uk/estates/depts/environ/waste.html
[8] http://www.nwf.org/campusecology/researchwaste.cfm
[9] http://www.sustainableunh.unh.edu/fas/food_syst_compost.html
[10] http://www.adm.uwaterloo.ca/infowast/
[11] http://www.pp.wmich.edu/rs/facts.html

Appendix C6: Useful Documents and Prototypes

GREENING the WSSD

The Consumption Barometer

Office Recycling Guide

February 2003

University of Wisconsin-Madison — **Academic and Office Buildings**

♻ RECYCLE ♻	WHERE	∅ PUT IN TRASH ∅
Office Paper **All colors—staples, tape, paper clips OK** Copy, computer, fax paper Glossy paper Junk mail (No CDs, plastic wrap) Envelopes (plastic windows and adhesive labels OK) Post-it notes Inter-D envelopes File folders Paper ream wrappers	Brown or black deskside bin.   Thin blue container with slotted lid.	Plastic or metal bindings or covers Food or candy wrappers Paper cups and plates Plastic product samples from junk mail Plastic/Tyvek mail envelopes Paper towels and tissue
Magazines, Phone Directories, Obsolete Books	Magazines, catalogues, obsolete books, and phone directories in black or blue crate. →	Plastic or metal bindings or covers Remove covers from hardcover books. Recycle remaining material. NEW
Books for Reuse NEW Unwanted books can be donated at the Memorial, Steenbock Botany or Wendt library book drops for reuse and resale.		Any publications printed on high quality paper, glossy brochures or reports are recycled with office paper.
Newspaper UW course timetables Paperboard (shoe box type material) Brown paper bags Glossy ad inserts	Newsprint, paperboard and bags in blue container. → 	Photographs
Cardboard Flattened corrugated (wavy center)	Cardboard stacked neatly near newspaper container.	Pizza boxes Wax-coated boxes
Aluminum Beverage cans only.		Foil
Glass Food and beverage jars and bottles only. Paper labels OK.		Dishes Incandescent bulbs Empty chemical bottles
Plastic Beverage, food, and detergent containers only. #1 PETE and #2 HDPE only, no lids.	Blue funnel-topped container.	Plastics # 3 through # 7 Empty chemical and medicine bottles Empty antifreeze or motor oil bottles
Steel Cans Food cans only. Steel lids from food containers. Empty aerosol cans.		Empty non-toxic paint or chemical cans

Environmental Management, 265-3417 www.fpm.wisc.edu/campusecology deinstein@fpm.wisc.edu

RECYCLING & WASTE DISPOSAL SERVICES

University of Wisconsin-Madison

February 2003

Material/Service	What do I do?	Notes	Whom do I contact?
General Recycling Information (Information guides, education and outreach, and recycling contract administration)	If you cannot locate the answer to your question using this chart, contact us directly.	Refer to the staff phone directory (pg. A10) for the "Office Recycling Guide." Check our Campus Ecology website for more details on UW-Madison recycling programs.	**Environmental Management** **Daniel Einstein** **265-3417** **deinstein@fpm.wisc.edu** **www.fpm.wisc.edu/campusecology**
New Recycling Bins	Call to place order.	Free to departments serviced by Physical Plant. Others can purchase containers at cost.	**Custodial Services** **Larry Walls** **263-3082** **275-5111 (pager)** **lwalls@fpm.wisc.edu**
Office Cleanouts	Call ahead to request delivery of wheeled containers.	When discarding large quantities of paper, special pick-up can be arranged. Call ahead.	
Bottles and Cans (Aluminum, steel, glass, and plastics)	Refer to the "Office Recycling Guide" for details on collection containers and acceptable materials.	Guides are available from Environmental Management (see above) or check page A10 of your UW staff directory.	
Paper: Cardboard, News, Office, Magazines, Directories, Books			
Ink jet cartridges (Small plastic "cubes" used by some printers.)	Place cartridge in Inter-departmental mail envelope. Address to: "Ink jet recycling." Drop in campus mail.	Cartridges are filled for re-use. ONLY Canon and HP brands. No Epson.	
Fluorescent Light Bulbs (Also sodium, halogen, and large incandescent.)	Call for pick-up of light bulbs.	Recycling recovers mercury, glass, and metal from bulbs.	
Sharps Needles, razor blades, scalpels etc.	See the Chemical and Safety Disposal Guide. www.fpm.wisc.edu/chemsafety	Hazardous sharps must be placed in approved sharps container, then deposited in large MERI receptacle. Call for more info.	
Broken glass and plasticware (Non-infectious only: Pipettes, pipette tips, fragile and broken glass.)	Package non-infectious materials in a sturdy cardboard box. Seal with tape. Mark box "Broken Glass." Set out box for custodial pick-up.	Box size not to exceed 18x12x10 inches (e.g., copy paper box is acceptable).	
Surplus Equipment/Supplies (Computers, furniture, office supplies, lab equipment, refrigerators, microwaves, and air conditioners—Broken and functional items.)	SWAP will assess goods for best method of disposal (resale, recycle, hazardous waste recovery or landfill). Call for property disposal form, assessment and pick-up. **Never** place broken computer equipment, microwaves, or refrigerators in trash. These items may contain hazardous materials.	Sales every week (8am-2pm). UW and state depts. only: Thursday General public: Friday 2102 Wright St., Madison Two blocks north of Madison Area Technical College (MATC), near Dane County Regional Airport (Truax). View available inventory at the SWAP website.	**SWAP** **Materials Distribution Services (MDS)** **Tim Sell** **245-2908** **swap@bussvc.wisc.edu** **www.bussvc.wisc.edu/swap**
Polystyrene Packing Material (Foam peanuts and rigid foam blocks or biodegradable starch peanuts.)	Place in clear plastic bags, clearly mark name of originating department on the bag, and place on loading dock. Keep starch separate.	If MDS does not make regular deliveries at your dock, call for pick-up. Clear bags may be ordered from MDS.	
Laser Toner Cartridges (For fax machines, printers and some copiers.)	Mark boxes "Return to MDS" and leave in MDS drop-off area, or call for pick-up of large quantities.	Cartridges are remanufactured for reuse. Empty containers used to refill copier toner reservoirs can be placed in trash.	
Loading Dock Pick-up Service	Call ahead for special pick-up of large quantities of waste or recycling materials.	Keep loading docks and receiving areas open. Do not abandon unwanted items on docks.	**Waste and Recycling** **Pete Lowrey** **262-1324** **575-2108 (cellular)** **plowrey@fpm.wisc.edu** **www.fpm.wisc.edu/waste**
Scrap Metal (Iron, aluminum, stainless steel, etc.)	Call for pick-up.	A roll-off dumpster is available for large quantities of metal. Metal is recycled.	
Tires	Call for pick-up.	Most tires are recapped and reused. Waste tires are shredded and burned for energy.	
Wood (Crates and scrap lumber.)	Place on loading dock next to trash dumpster.		
Pallets and Skids	Stack all pallets and skids, regardless of condition, neatly on loading dock.	Do not place in dumpster. Pallets are re-used on campus or sold for re-use.	
Auto Batteries, Lead Acid Only (Car, boat and forklift.)	Call for pick-up.	Lead from auto batteries is recycled.	
Automotive Fluids (Waste oil, antifreeze, and Freon refrigerant.)	Call for information.	Waste oil is re-refined. Antifreeze and Freon are filtered and reused on campus.	
Waste & Surplus Chemicals (Lab and industrial chemicals, acids, cleaners, paint, and solvents.)	Call for information. Many items can be reused.	Check Safety website for on-line chemical exchange listings.	**Safety Department** **Molly Stone** **262-8769** **mstone@fpm.wisc.edu** **www.fpm.wisc.edu/safety**
Rechargeable Batteries (Small "disposable" batteries used in computers, cameras, and tape players, etc.)	Place re-chargeable batteries (nickel, lithium, lead and button cell) in Inter-departmental envelope marked "Battery recycling." Send via regular campus mail.	Alkaline batteries are safe in normal trash. Contact Environmental Management (above) for detailed program flyer.	
Plastic and Steel Barrels (20-55 gallon capacity)	Call for pick-up.	May contain hazardous waste. All barrels are handled through Safety, regardless of contents.	
Waste Oil, Non-Automotive	Call for pick-up.		
Ballasts, Large Capacitors	Call CARS at 3-3333 to arrange pick-up.	May contain PCBs.	
Lead, Mercury, Asbestos (Includes broken thermometers.)	Call for pick-up.	Requires special hazardous materials handling.	
Confidential Document Shredding	Call for pick-up ($2.50/box charge)	Paper is recycled after confidential destruction.	**State Records Center** **266-2995**

Close the Loop: Buy recycled content products.
Download the most current edition of this chart by visiting: http://www.fpm.wisc.edu/campusecology/recycle.htm

Where else to recycle – The Fairest Cape Association Recycling Directory

The following is an excerpt from the Fairest Cape Association recycling directory. For a more complete and up-to-date directory, call 462-2040. http://www.fairestcape.co.za/

Paper

- There are many companies who will collect and buy your paper. Phone the FCA Hotline 4622040, for the phone numbers of your local paper agent
- REVIVA Plus is a new, improved locally manufactured, wholly recycled paper suitable for ink jet and laser desktop printers. contact SAPPI FINE PAPERS at 021 5312523.
- SAPPI War On Waste 0800 221330
- NAMPAC Recycling 021 545356
- MONDI Recycling 021 9315106

Glass

- Cape Bottle Wash 021 951 6101
- Cape Bottle Recyclers 082 3727117
- Two Oceans Recycling 021 9515502

Batteries

- Booster Batteries (lap top, video camera, cellphone, power tools) 712-7190

Computers

- PC Bank (donations of 486 and up) 685-5766
- Cape Precious Metals 021 5512066

Printer cartridges

- Inkjet Refils 712-3713
- Cartridge International 422-0182
- Toptronics 461-1777

Plastics

- Plastics Federation (info on Green Cages) 011 314-4021 web site www.plasticsinfo.co.za
- Eco Plastics Recovery (Enoch) 011 8280720

Drums

- Peninsula Drums 34-1161

General Non-Commercial Depots

- AEP Scrap – Cnr Lansdowne & Duinefontein Rds, Muizenberg 692-0531
- Cannon Scrap – 77 De Waal Rd, Diep River 712-4583
- False Bay Recycling – next to Masepumele off Kommetjie Rd 785-1938
- Southern Recycling – Cnr Scaapkraal & Skaap Rds, Retreat 706-3696

Hazardous Waste

- Visserhoek Waste Management Facility 557-6160
- Waste care 948-6180
- Cape Metropolitan Council Waste Management Department 487-2477

Household Hazardous Waste

- Cape Metropolitan Council Scientific Services 637-9090

Metal

- False Bay Recycling 785-1938
- Cape Precious Metals 551-2066
- National Scrap 906-0808
- SA Metal 511-0839

Builders Rubble

- "The Old Kaolin Mine" - Oceanview opposite Imhoffs Gift.

Non-Recyclable Mixed Waste

- Enviroserve – Wastetech at Vissershoek 557-6106
- Cape Metropolitan Council Landfills 487-2477

Old Motor Oil

- The Rose Foundation for storage tanks near you 0800-107-107

CITY OF CAPE TOWN

Integrated Waste Exchange

- **IWEX** is a free service for all South African businesses - matching "waste material generators" to "waste material users"
- **IWEX** lists material requests/offers on the IWEX **catalogue** via a **listing form**
- **IWEX** is a clever money and resource saving "waste management tool" (**Success Stories**)
- **IWEX** can turn fixed costs for disposal, materials and storage into savings.
- **IWEX** conserves energy, resources and landfill space.

IWEX is the waste solution for your business in the 21st century. Become a participant in the international effort to conserve energy and resources. Protect our environment while saving money.

WHO SHOULD USE THE IWEX

Industry/Commerce

- Companies wanting to reduce disposal costs
- Companies having "outputs" that can be used as "inputs" for other businesses (industrial symbioses)
- Companies wanting to gain a competitive edge by utilising their resources effectively and sustainably
- Companies wanting to sell / donate surplus products
- Companies wanting to determine by-product marketability
- Companies having off-specification or obsolete products, raw materials or equipment
- Companies wanting to make environmentally conscious decisions
- Companies wanting to boost their public image and social responsibility

Recyclers and Waste Collectors

- Recyclers/collectors looking for new markets and materials
- Recyclers wanting to increase their input volumes and capacity
- Recyclers wanting a regular supply of large volumes of recyclables
- Collectors wanting to save on storage costs and avoid stock piling.

Community Groups

- Communities requiring REGULAR volumes of certain (non-hazardous) waste materials for community projects
- Communities wanting to link up with companies to form public-private waste partnerships

Why use the Integrated Waste Exchange

Landfill Realities

- Disposal costs at landfill sites in South Africa have increased by 700% since 1991
- Disposal costs increased by 88% in Cape Town in 1999
- Disposal costs are expected to increase sharply as landfill space diminishes
- Four out of the six landfill sites that serve Cape Town will close down within the next four years.

HOW TO USE THE IWEX: MAKING AN EXCHANGE

- All arrangements, such as cost, quality and transport of goods are to be negotiated between interested parties.
- Click on the waste category for your waste offered/wanted requirements. All listings have a contact name and phone number allowing you to directly contact the lister.

Waste Catalogue

Available	Wanted
Acids	Acids
Alkalis	Alkalis
Batteries	Batteries
Building Waste(C&B)	Building Waste(C&B)
Carpets	Carpets
Cartridges	Cartridges
Compostable Wastes	Compostable Wastes
Computers/Electronics	Computers/Electronics
Dyes/Inks	Dyes/Inks
Furniture	Furniture
Glass	Glass
Industrial/Other Equipment	Industrial/Other Equipment
Inorganic Chemicals	Inorganic Chemicals
Laboratory Chemicals	Laboratory Chemicals
Metal/Metal Sludges	Metal/Metal Sludges
Miscellaneous	Miscellaneous
Oil/Waxes	Oil/Waxes
Organic Chemicals	Organic Chemicals
Paints/Coatings	Paints/Coatings
Pharmaceutical Wastes	Pharmaceutical Wastes
Plastic/Rubber	Plastic/Rubber
Solvents	Solvents
Textiles/Leather	Textiles/Leather
Wood/Paper	Wood/Paper

wasteexchange

City of Cape Town
Waste Management Department
38 Wale Street
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