UCT GREEN CAMPUS ACTION PLAN

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Compiled for the Properties and Services Department

University of Cape Town

Prepared by

Sandra Rippon

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Prepared for Properties and Services, UCT by:

Sandra Rippon - Balance Design: *Sustainable Built Environments*
The Palms Centre, Sir Lowry Road, Salt River
Cell: 083 286 7535
Email: srippon@xsinet.co.za

1. INTRODUCTION

1.1 BACKGROUND TO THE ACTION PLAN

UCT has gradually established a commitment to a sustainable campus over the last few decades, since the signing of the Talloires Declaration in 1990. Little progress was made in terms of this commitment until 2001 (other than a recycling campaign in the mid-1990s). The Environmental Management Working Group (EMWG) was formed in 2001 to coordinate the implementation of the Talloires commitments, and in the same year, Vice Chancellor Ndebele recommitted UCT to environmental sustainability in a statement published in the Monday Paper. In 2001 a full time Environmental Officer was appointed in the Physical Planning Unit of the Properties and Services Department; however this position became vacant after a few years and was not filled again until 2007. A draft Environmental Policy was developed by the EMWG and finalised in early 2003, but was not formally adopted by the university leadership until 2008. Finally taking a more active approach, the Properties and Services department and the EMWG embarked on a process towards implementing an Environmental Management System (EMS), based on the ISO 14000 model in 2003. This *Initial Review towards an EMS*, being the first step towards an EMS, identified the environmental aspects and impacts of UCT's operations and activities, and made recommendations for the mitigation of these impacts. The *Initial Review* report has been used during the last five years to guide the activities of P&s towards more sustainable buildings, facilities and operations.

The most recent initiative towards sustainability at UCT has been the development and adoption of a *Green Campus Policy Framework, May 2008* by the University Building and Development Committee (UB&DC), Senate and Council in June 2008. This policy document was developed by Prof. Martin Hall and Noeleen Murray. Appended to the policy document is the earlier draft policy developed by the EMWG in 2003 – The *University of Cape Town Environment and Sustainable Development Policy, 2003*. This environmental policy deals with a broader range of aspects than the Framework, by including research, education and outreach. These aspects are not dealt with by this project, but remain relevant and critical to a broadly sustainable campus.

Within the student arena, where there has been a lack of activity around the environmental agenda in the last five years, there have been exciting developments during 2008 with the establishment of a Green Campus Initiative (GCI). This was started by students in the Botany department and grew rapidly to a membership of more than 500 students. The GCI has undertaken a number of successful projects, including holding a 'Green Week' in August 2008, starting a waste recycling project in the outdoor areas and developing a web-based car pooling scheme. The Vula website at UCT now provides a central forum and information source on the activities of the GCI.

The aim of the *Green Campus Policy Framework* is to draw together existing initiatives and provide an operational plan, a strategy for reduction of the university's carbon footprint, and indicating the university's key aims and objectives with respect to environmental issues. The *Green Campus Policy Framework* identifies some key objectives, namely:

- Energy savings:
- Reduction of carbon emissions;
- Recycling and;
- Water conservation.

Further to these objectives, the policy recognises the need for a holistic approach to integrating sustainability thinking and practice across all aspects of university life, addressing issues in ".... teaching, research, outreach, strategic planning and operations." It also referred to an earlier Environmental Thrust at UCT in 2004, the PASE initiative (Partnership for a Sustainable Environment). The aim of PASE was to establish UCT as "...the internationally recognised leader of research, teaching and outreach in the field of environmental sustainability within the African context". Although the PASE initiative has since become dormant, it is suggested that efforts be made to build on this work and move forward on the objectives of PASE. Ideally, this would occur simultaneously with actions relating to operations and maintenance contained in this plan. This work could be undertaken by the proposed Green Campus Unit, a structure of the GCI, discussed under Section 5 Institutional Arrangements.

The *Green Campus Policy Framework* made recommendations for the way forward, some of which this project is intended to address:

- The creation of specific milestones and delivery targets as a way forward
- Partnerships and outside operators, where deemed necessary
- Awareness and communication strategies
- Adoption of practices at faculty level

1.2 PROCESS OF DEVELOPING THE ACTION PLAN

This project has been commissioned by the Properties and Services Department, with the approval of the EMWG. The aim of this project is to develop a *Green Campus Action Plan* in a relatively short time period in order to take advantage of the present momentum that exists at UCT around environmental issues and start the process of implementation. To meet these timeframes, field work on the campuses has been limited, relying on information gathered in the 2003 study. This project has been largely a desktop study with some research in the form of interviews with key personnel and information gathering from central sources such as Properties and Services (P&S) and the EMWG. The focus of the

project has been activities of UCT Properties and Services, namely facilities development, maintenance and operation, since these are within the sphere of influence of the department. Other departments included are ICTS and Procurement.

Documentation review included the EMWG minutes; Initial Review towards an Environmental Management System, 2003; Annual Report of EMWG 2006/07; the Carbon Footprint of UCT 2008; and the Sustainable Kramer Project Report 2008. Internet research relating to successful campus greening initiatives was undertaken, with a focus on the Harvard Green Campus Initiative. Interviews were held with the following persons:

- John Critien — Executive Director, Properties and Services
- Brett Roden — Environmental Risk Officer, Properties and Services
- Andre Theys — Engineering Services Manager, Properties and Services
- Richard Hill — EMWG; Physical Planning and Landscape Sub-Committee and UB&DC committee
- Merle Sowman — EMWG; Environmental and Geographical Science
- Andrew Marquard — Energy Research Centre, UCT (Carbon Footprint Study team)
- Denis van Es — Energy Research Centre
- Trevor Adams — Procurement Department
- Susan Botha — Founder and Chair of the Green Campus Initiative
- Tom Herbstein — Coordinator of the Sustainable Kramer Project

Attendance at a meeting of the Properties and Services EXCO provided an opportunity to engage with a group including John Critien, Duke Metcalf, Geoff de Wet, Brett Roden, Michael Langley and Chris Briers.

A Reference Group comprising Merle Sowman, Richard Hill and Brett Roden provided input, particularly regarding the process to be undertaken. This group held a meeting with representatives of the GCI (Susan Botha and Nicolas Wiid) and Tom Herbstein, leader of the Sustainable Kramer Project.

To promote participation in and communication about this project, a workshop attended by about 30 students and staff, was held in November 2008 at the Botany Department. The main agenda was to discuss the criteria for prioritising the Actions, and the institutional challenges faced. Subsequently the draft was circulated for comment to the Environmental Management Working Group (EMWG). Since the EMWG is a sub-committee of the University Building and Development Committee and is thus part of the formal decision-making structure of UCT, this was seen as an appropriate forum for seeking support and consensus on the Action Plan.

The culmination of this project process was a presentation of the draft Action Plan at the December 2008 EMWG meeting, with participation by student representatives, providing an opportunity to discuss the detail of the proposed actions. Comments were received from

the attendees and incorporated into a revised draft of the Action Plan, included here in Section 4.

1.3 CONTEXT – PHYSICAL, INSTITUTIONAL AND LEGAL

1.3.1 Physical context

This project relates to UCT in its entirety, across all campuses, and across a broad range of activities including teaching, research, administration, residences and sports. Although the campuses have a wide geographic spread, it is considered desirable that the same practices are followed on all campuses. It may be necessary to identify representatives and champions to implement the Action Plan on the satellite campuses such as Medical School and Hiddingh.

1.3.2 Institutional Context

Transformation towards a sustainable campus will require change within a large institution. There is much research into the challenges of achieving change within Higher Education institutions, some of which is referred to in the Green Campus Policy Framework and the 2003 Initial Review, and has therefore not been repeated here. The theory of successful campus greening is explored through the example of Harvard University. The lessons learned by the Harvard Green Campus Initiative[1] have been well documented. Leith Sharp, founding Director Harvard Green Campus Initiative, has written of her experiences of institutional change in an article entitled "*Green Campuses: The Road from Little Victories to Systemic Transformation*". Sharp proposes that new ways of transcending the organizational constraints characteristic of universities need to be explored, so that new potentials of systemic transformation towards campus environmental sustainability can be achieved. According to Sharp, successful Green Campus Initiatives (GCI's) are characterised by a few key features:

- They are able to thrive in the 'dynamic complexity' of the university because they strike a balance between appearing rational (strategic plans, business models, and formal decision-making forums) and operating irrationally (organic, adaptive, networks of trust);
- They are ready to embrace emerging opportunities, shifting priorities and resources;
- They remain adaptive in their structure and staffing; and
- Are adept at building networks and diverse relationships.

[1] http://www.greencampus.harvard.edu

Successful approaches of leading Green Campus Initiatives:

- Obtaining management support - securing a commitment in principal from the leadership
- Effective coordination - dedicated, respectfully persistent
- Maximising face to face communication
- Building both formal and informal support
- Taking the path of least resistance – run with ideas that attract the most support
- Trial, review, expand – starting with pilot projects and building on their success
- Risk tolerant management staff - willing to support low risk innovation
- Student partnerships – both paid and research positions
- Continuity - allowing 2-3 years to establish relationships and skills to be effective in medium to long term projects
- Creating forums – for broad community involvement, discussion and consideration
- Information systems - a means of capturing and presenting information in digestible formats for all levels of management

Source: Sharp, L *Green Campuses: The Road from Little Victories to Systemic Transformation*

The Harvard Green Campus Initiative has clearly been successful and has been voted the highest ranking in a "College Sustainability Report Card" that graded 300 U.S. colleges and universities. The Harvard Office for Sustainability team works across a population of over 40,000 individuals in 600 buildings to ensure continuous improvement in campus design and operations in support of campus sustainability. There is a particular focus on reducing Harvard University's greenhouse gas emissions which have been increasing at a steady rate of around 4% per year since 1990. Harvard has instituted a wide variety of projects and programmes: converting shuttle buses to biodiesel, broadening renewable energy projects, instituting organic landscaping, providing growing technical support for waste reduction, and continuing to implement environmental education programmes. In the last 2 years a number of schools at Harvard University have started to reverse this upward trend and are now reducing their emissions each year.

Funding the Harvard Green Campus Initiative

The Harvard Green Campus Initiative is funded 70% by 'fee for service' partnerships with Harvard's Schools and Departments and 30% from Central Administration in 2008. The

volume of HGCI business funded by the schools and departments has grown from nothing in 2001 to over $1.7 million in 2007. The HGCI has exceeded all expectations in its ability to foster a viable business model for pursuing campus sustainability across the campus. It also administers a $12 million revolving loan fund, which is used across Harvard to fund a wide range of projects that have environmental and financial returns for Harvard University. To date over $8,000,000 has been invested in more than 150 projects with an average return on investment of over 30%.

Relevance to UCT

Two key aspects of the Harvard precedent are proposed for adoption at UCT:

1. A Green Campus Office or Unit
2. A Green Campus Loan Fund.

The concept and role of a Green Campus Unit (a unit of the Green Campus Initiative) is described in the UCT Green Campus Policy Framework, which has been adopted, implying an acceptance of this model. Thus setting up this unit is a task to be addressed in the short term. Institutional arrangements for UCT are discussed further under Section 5 below.

The financing of a Green Campus Action Plan requires a process to arrive at some appropriate models for UCT. It is envisaged that a funding model will be developed through a process of engagement within the UCT leadership and community and is envisaged to take place during the first half of 2009.

A more detailed description of the start-up history, principles, programs and activities, funding and institutional arrangements at Harvard can be found in Appendix E of this report.

KEY DRIVERS OF CARBON MANAGEMENT

Carbon management for Higher Education Institutions enables HEIs to:

- **Save money** – by managing and reducing energy bills
- **Increase competitiveness** — by being one of the best-managed universities
- **Meet regulation** – preparing for incoming regulation and legislation
- **Lead by example** – influencing business and the community
- **Improve reputation** – responding to student and community expectations.

Source: The Carbon Trust –Introduction to Higher Education Carbon Management

1.3.3 Legal Context

There has been a considerable amount of new legislation and policy dealing with environmental issues within South Africa at national, provincial and local level during the last five years. Some of the policy work is overlapping and potentially confusing, such as in the areas of energy and climate change; however, the advantage is a wide range of strategies and targets against which UCT can compare and measure their own plans.

The key issues that emerge are climate change, energy, waste management and air quality. Another issue that has particular relevance within the Western Cape is biodiversity. A new national Biodiversity Act has been promulgated, leading to a range of initiatives such as the establishment of the South African National Biodiversity Institute (SANBI) and the development of various bioregional plans including the Cape Action Plan for the Environment (CAPE).

The provincial department of environment – the Department of Environmental Affairs and Development Planning (DEA&DP) - has produced a number of policy documents; a Sustainable Development Implementation Plan; and Action Plans for both climate change and sustainable energy. At local level, the City of Cape Town has a proactive environmental management department that is keeping pace with the Province with a range of environmental plans and strategies. UCT, as a leading institution in this context, and often involved in research for the policy documents, should be aligning closely with these provincial and local government policies and initiatives. The targets contained in these plans

provide a basis for the targets in this Green Campus Action Plan and are highlighted in the description of the legislation in Appendix D.

This report deals with legislative and policy developments during the last five years only. The 2003 *Initial Review* Report may be referred to for earlier legislation. For reference, a comprehensive list of all relevant legislation and policy is included in Appendix D.

International Agreements/Policy

- The Bali Accord on Climate Change 2007

National Legislation

- National Environmental Management: Biodiversity Act, No 10 of 2004
- National Environmental Management: Air Quality Act (AQA), No 39 of 2004
- National Environmental Management: Environmental Assessment Regulations 2006
- National Energy Act, No 34 of 2008

Other Relevant Policy

- National Climate Change Response Strategy 2004
- White Paper on Renewable Energy Policy 2004
- Energy Efficiency Strategy of the Republic of South Africa 2005
- National Framework for Sustainable Development (NFSD) 2008

Draft National Legislation

- National Environmental Management: Waste Management Bill 2007
- Renewable Energy Feed-in Tariff and Incentives Bill 2008

Provincial Policy

- Sustainable Development Implementation Plan (SDIP) 2006
- Western Cape Sustainable Energy Strategy and Programme of Action March 2008
- A Climate Change Strategy and Action Plan for the Western Cape March 2008

Local Authority

- Air Quality Management Plan 2005
- City of Cape Town Energy and Climate Change Strategy 2006

Best Practice Standards

- Green Star SA – Office v1 Rating Tool 2008
- South African National Standard: SANS 204 Energy Efficiency in Buildings 2008

2. METHODOLGY FOR SELECTION OF ACTIONS - VISION AND CRITERIA

2.1 What is our common vision?

Two contrasting potential goals have been identified:

A. To achieve broad sustainability –to integrate environmental, social and economic sustainability into operations, curricula and research – essentially transformation to a sustainable campus.

B. Alternately, the approach could be to prioritise actions that can be achieved in the short term, creating momentum and successes that would contribute to building the programme, from which lesson could be learned.

There appears to be a consensus that UCT should ultimately become broadly sustainable campus including social and economic sustainability in all aspects of the university life, as is defined by the Talloires commitments and the vision of the Global University Leaders Forum. However, in keeping with the brief for this project, to take advantage of present momentum and develop an Action plan, the second vision B was considered appropriate.

Step 1: Mobilise the Organisation -

- *Build an effective team*

Step 2: Set baseline, forecast and targets

Step 3: Identify and quantify options

- *Compile options, prioritise, costs and benefits*

Step 4: Finalise strategy and Implementation Plan

- *Selected projects should meet the strategic objectives*

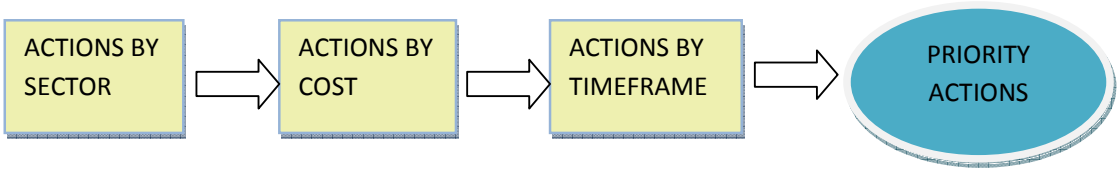
Step 5: Implement plan

Box 2. The UK Carbon Trust Approach

2.2 How to Prioritise the Actions?

Having reviewed the register of Aspects and Impacts, and the Key Recommendations of the 2003 *Initial Review*, a report was produced on the progress made by UCT on these earlier recommendations (Section 3). This exercise identified those areas that needed attention. The next step was to compile a comprehensive list of all options and then to prioritise these. This approach was informed by that provided by the UK Carbon Trust (Refer Box 2). The actions that were incomplete, or not yet implemented were listed by sector (e.g. Energy, Water, and Waste); by cost implications, namely 'No Cost' and 'Low Cost' (behavioural) and

those requiring capital expenditure. A further analysis of the range of actions, by timeframes, formed another background document to inform the priority actions. This is illustrated in the diagram below.



Having compiled the options, a set of criteria for selection were developed and consensus on these was sought through a workshop forum. (Refer to Table 1)

TABLE 1: CRITERIA FOR SELECTION OF ACTIONS

Low capital cost	Reduction of carbon emissions	Payback period (ROI)
Cost saving	Effective	Broad sustainability
Resource efficiency	Education and demonstration	Job creation – local economic development
Compliance	Visibility	Easy

A synthesis of these lists of options, filtered through the criteria in Table 1, resulted in the Priority Action list which is the core of the Green Campus Action Plan, Section 4. Refer to the lists of options that informed the Action Plan in Appendix A, B and C.

Various comments were received from the workshop on how to prioritise the actions and from the interviews. These ranged from the idea of 'doing them all' to selecting those actions that embodied a broader sustainability, for example, those that would generate local employment while also contributing to resource efficiency or reducing carbon emissions. The outcome was to include all the low cost and behavioural actions, and all those that could be achieved in the short and medium term. In addition, a few actions requiring capital expenditure were also selected, being those that would produce operational savings or allow measurement of performance and data collection to establish baselines of resource consumption e.g. installation of electricity meters to each building. While the resulting list is quite long, it is hoped that it will therefore provide guidance for a few years to come. The majority of the actions have a short to medium term timeframe, from immediate to two years.

As mentioned above, the *Green Campus Policy Framework* identifies some key objectives as Energy savings; reduction of carbon emissions; recycling and; water conservation. While these do form the basis of this Action Plan, a somewhat different and expanded set of categories has been adopted. New categories include Landscaping and Biodiversity, Indoor Air Quality, Emissions, Construction, and Transport. In addition, a set of strategies which relate to institutional changes has also been provided.

The Action Plan table comprises strategies, responsibilities and targets (where applicable) and timeframes. This Action Plan should remain a 'living document', responding to changes in focus, available funds, skills and capacity. Adaptability and flexibility, as highlighted by the Leith Sharp's study of successful Green Campus initiatives, "...*embrace emerging opportunities, shifting priorities and resources*." It should be reviewed at agreed intervals, either annually or every six months. Indicators for success will need to be developed, as well as monitoring and evaluation programme.

3. PROGRESS WITH ENVIRONMENTAL MANAGEMENT AT UCT FROM 2003-2008

An outcome of the 2003 *Initial Review towards an EMS at UCT* was a set of Key Recommendations for progress towards a sustainable campus. A review of progress with these recommendations has been undertaken, largely through the interview process of this project, but also from observation.

Those issues that have made good progress have been highlighted in green, moderate progress is described as 'some progress' and where there has been no progress this is noted as 'Not yet implemented'. This review of progress has informed the strategies contained in the Green Campus Action Plan in chapter 4.

ENERGY		
	2003 Recommendations	**Progress / Status 2008**
1.1	P&S to introduce financial penalties and incentives to encourage departmental reduction in electricity consumption.	**Not implemented**. Electricity sub-metering at building level is under consideration.
1.2	Raise awareness among students and staff about electricity conservation by supplying them with guidelines at orientation for electricity conservation behaviour. Reinforce the message with well-designed signage at light and equipment switches.	Power outages have had the effect of raising awareness. Intranet notices have proved successful in obtaining co-operation. Signage should still be erected. The GCI plan awareness raising campaigns during student Orientation and Green Week
1.3	ICTS to establish a policy to activate the **energy saving modes** on all computers and monitors, especially in computer laboratories - on both new and existing computers.	**Not yet implemented**
1.4	Extend the installation of Building Management Systems (BMS) in selected buildings	A central, web based BMS is now more appropriate. The existing BMS equipment now requires total replacement with new technology to remove current vendor lock. This will allow better energy management of central HVAC.
1.5	Commence phased refit of light fittings across all campuses, to replace incandescent lamps with compact fluorescent lamps (CFLs), and to replace fluorescent tube lamps with new, energy-efficient fluorescent units (T5 & T8).	**Some progress** Fluorescent lamps (T8) have been retrofitted (85%) but the ballasts have not always been replaced with electronic ballasts (50%). - MCB have had all luminaires retrofitted with T8 lamped electronic ballasts.

		- RW James and Centlivres are earmarked for next retrofit. - T5 will not be considered until stability of voltage in SA improves, or until manufacturers produce T5 lamps suited to UCT supply - and not importing European specification lamps. Contrary to suppliers promises considerable premature T5 lamp failures in the larger lecture venues have been experienced - **Kramer has completed an audit and costing report for retrofitting the building, and done some retrofitting**
1.6	Install lighting control to conserve electricity e.g. timer switches, photocells and occupancy sensors, where appropriate in terms of activities.	**Not implemented**. Occupancy sensors have been piloted in some areas and now this needs to be implemented by retrofitting in selected areas e.g. Libraries, Archives, and Meeting Rooms. (Occupancy sensors only considered for new buildings or alterations.) All external lighting has been changed from timers to photocells. - Retrofits will only take place once all lamping technologies have been updated.
1.7	Install heat pumps in locations where water heating and air-cooling are required in the same location.	**Some progress** This has been done as far as possible in Residences and Sports Club, where hot water is used – no further heat pumps are envisaged, except in new buildings.
1.8	Investigate, plan and budget for eventual replacement of old HVAC chiller equipment.	**Some progress** Investigation has been ongoing. A consortium of universities has been formed and discussions held with Eskom. P& S to lead the consortium further and plan a long term upgrade.
1.9	UCT-AC policy implementation	**The Air-con Policy has not been consistently implemented, due to pressures from users.**
WATER		
	2003 Recommendations	**Progress / Status 2008**

2.1	Complete installation of retrofitting toilets and urinals with water-saving devices. Programme of retrofitting toilets and urinals should be extended to the student residences	**Some progress** Retrofitting of toilet flush valves has reportedly not been continuing due to budget and logistical constraints. No progress on waterless urinals. **Kramer has fitted all urinals with waterless valves and they are working well.**
2.2	The irrigation system must be maintained in working order and automated to improve efficiency (by only watering when evaporation is low at night) and prevent wastage through human error.	**Some Progress** The irrigation system is now partly automated (approx. 50 %). Baxter & Residences systems have been upgraded. Advances have been made in installing drip irrigation, used at the new Graca Machel Residence.
2.3	Remove sedimentation build-up by dredging the dam on Upper Campus, and any other measures or repairs to increase the capacity.	**Good progress** Dam wall has been raised, increasing dam capacity by 5 million litres. This saves potable water that would otherwise be used for irrigation (cost per annum approx. R3.3m or R6.3m if sewerage tariffs are included).
2.4	Removal of all alien trees and shrubs above the dam is recommended as this is likely to improve water run-off into the dam.	Removal of invasive alien vegetation is ongoing
2.5	Raise awareness among students about water conservation by supplying them with guidelines at orientation for water-wise behaviour. Reinforce the message with signage in bathrooms.	**Not yet implemented**
WASTE		
	2003 Recommendations	**Progress / Status 2008**
3.1	Develop a **waste minimisation strategy** as the first priority of a **Waste Management Plan**. The strategy to include integrated planning, public participation and education about waste management - 'Reduce, Reuse, and Recycle'.	**Not presently implemented** The waste recycling taking place in 2003 was halted due to poor financial feasibility. A new waste recycling contract has been entered into for commencement in Jan 09. This will involve separation at source for office paper and also strategically placed recycling bins throughout the various campuses.

3.2	UCT should aim for waste prevention by making purchases that have less packaging. Preference could be given to suppliers who can offer environmentally acceptable packaging schemes, and packaging take-back.	**No progress** Procurement department reportedly do have the ability to influence suppliers of bulk purchases
3.3	Use all forms of media to raise awareness among students and staff on waste reduction, reusing and recycling e.g. Monday paper, UCT website, UCT radio, posters, signage. Awareness initiative should highlight the importance of changing consumption patterns.	**Not implemented** GCI have made some progress in raising awareness about waste recycling
3.4	Create incentives for waste prevention, e.g. incentives could include cost saving for double-sided photocopying and setting up printer cost charging systems for UCT networks	**Not implemented** A changed scenario due to growing awareness. Environmental responsibility can now provide sufficient incentive
3.5	Develop and implement a strategy for dealing with used printer cartridges. The strategy could include: • a centralised service for refilling used ink cartridges, • practical solutions for reusing and • recycling inkjet and laser cartridges	**Not implemented – although some departments do recycle cartridges** However, a range of options have already been investigated by the Procurement department and could be implemented quite soon (2009)
3.6	Create incentives for UCT departments to use unbleached and/or recycled paper.	**Not implemented** Recent developments have improved the availability of papers (printing and photocopying) with reduced environmental impact. All major suppliers have products available. Bulk purchase could keep additional costs low.
3.7	Research the feasibility of waste separation at source in Residences.	**Some progress** The student initiative GCI has begun such a programme
LANDSCAPING (AND BIODIVERSITY)		
	2003 Recommendation	**Progress / Status 2008**
4.1	*Indigenous water-wise plants* Any new planting should be water-wise, drought resistant and indigenous.	This recommendation was not aligned with UCT Landscaping policy in that aesthetic and heritage issues have priority

	Further recommendations are that plants be grouped according to water requirements.	over water conservation/biodiversity in some areas. Drought and wind resistant plants are used wherever possible and appropriate
4.2	Mulching is also essential to reduce water evaporation	Mulching is standard practice, both for water conservation purposes and as part of other horticultural practices
4.3	Planted areas should be reviewed, and possibly changed to improve water conservation	Review of the Estate is an ongoing process
4.4	*Upper Campus Forest* The recent report on conservation of the Groote Schuur Estate (CNDV, 2002) recommends the gradual removal of the Pinus *Pinaster* plantations above UCT Upper Campus, as well as the removal of *Pinus Radiata*, with only the Pinus *Pinea* (Stone Pines) being retained. It is recommended that the same policy be adopted on Upper Campus and elsewhere on UCT property.	**Some progress** Debate has been ongoing and this has proved to be a contentious issue. A public participation process is planned for Dec 2008, to establish support for a forest management strategy, including the Pine tree issue.
4.5	*Alien control* UCT should continue the programme of controlling aggressive invaders, especially Acacia species, with emphasis on those species that need to be removed in terms of the legislation (Conservation of Agricultural Resources Act 43 of 1983).	Removal of invasive alien vegetation is ongoing and has been for many years part of the ongoing UCT Estate management
4.6	*Composting* Wherever possible, all compost used should be produced on campus, using material obtained on campus	**Good progress** All vegetation is being composted on upper campus and reused on planting beds. Space may present a problem in future.
4.7	*Herbicides* The use of herbicides should be carefully controlled. Acceptable types and quantities of herbicides must be specified in the landscaping contract.	Herbicides are used mainly to control weeds. Manual removal of weeds is considered too labour-intensive. Notice is provided of plans to spray by 'Pop-up' notices as well as by way of removable notices in the public areas themselves during the spraying process. Concerns exist re health and safety issues.
4.8	*Contractor's performance* The landscaping contractor's performance should be assessed	The performance of all contractors at UCT is managed by the relevant departments on an ongoing basis to ensure compliance.

	regularly to ensure adequate standards are being maintained.	The management of the relevant contracts is reported to be well documented. Review is the responsibility of the Physical Planning and Landscape committee.
HAZARDOUS WASTE AND MATERIALS		
	2003 Recommendation	**Progress / Status 2008**
5.1	P&S/UCT should aim for waste prevention by making purchases that produce less hazardous wastes and seeking suitable alternatives to substances that produce hazardous waste.	**Some progress** - there is a move away from Radionuclide use to using fluorescent markers Policies and guidelines for the control of Hazardous substances have been developed. Still to be fully implemented by UCT.
5.2	Maintain records of all incoming and outgoing chemicals, wastes and other hazardous and/or toxic materials. These records should be auditable.	**Good progress re Policy – Implementation ongoing** Policies covering a comprehensive range of hazardous substance have been developed.
5.3	Develop and implement minimum training standards for laboratory cleaners, technicians and students on handling hazardous chemicals, materials and wastes	**In progress Aug-Oct 08** Environmental Risk Officer at P&S provides training and is developing further courses.
5.4	Develop and implement a coordinated procedure for dealing with Genetically Modified Organisms (GMO's).	**Good progress** A GMO's committee has been established, is operational and reporting to Dept of Agriculture. Labs have been registered.
5.5	Ensure compliance with all legislation on waste, emissions, genetically modified organisms and other relevant legislation	**Good progress:** Significant improvement in achieving compliance (pers. comm. B. Roden)
5.6	Develop and implement guidelines for the disposal of fluorescent tubes (or the mercury in them).	**Good progress re fluorescents** Guidelines are in place, the fluorescent tubes are collected and crushed in purpose built drums by trained personnel with proper PPE; Hazardous Waste Contractor removes the drums. - EO in process of organising battery and CFL collection by outside party.
5.7	Carry out an **inventory** of all departments that produce hazardous waste and re-establish collection and disposal procedures	**In progress Aug-Oct 08** An Inventory of all Hazardous substances and Waste has been called for by P&S. A collection /disposal opportunity will be offered to departments

5.8	Develop and implement a strategy for and collection of sharp objects e.g. syringe needles and broken glass.	**Good progress** All sharps are collected from laboratories in purpose made plastic containers that are routinely collected by Hazardous Waste Contractor, presently disposed of by incineration.
5.9	All departments that produce hazardous waste at UCT should have a dedicated storage room for their waste	**Ongoing** New facilities have been established at Chemical Engineering for EBE and at Health Sciences. Plans in place for Science Faculty, temporary store presently in place.
5.10	Encourage the use of non-hazardous substitutes in UCT's activities.	**Ongoing**
OLD EQUIPMENT (E-WASTE)		
	2003 Recommendation	**Progress / Status 2008**
6.1	Formulate and implement a policy for the disposal of old and obsolete equipment. The policy could explore all options e.g. sell to UCT community, send to scrap (recycling), refurbish, repair, donate or disposal.	**Not implemented** Environmentally responsible disposal of e-waste has since become a well recognised environmental issue and a number of services are now offered by the private and NGO sector. Job creation can be a positive impact of recycling this waste.
6.2	Raise awareness on existing policies for disposal of obsolete equipment so that departments can know and use them. For instance, ICTS policy of collection of obsolete computers. Such a system exists, but is under-utilised due to lack of awareness	**Not implemented** It appears that there is presently no take-back system by ICTS; however some uncertainty exists, due to lack of information.
EMISSIONS		
	2003 Recommendation	**Progress / Status 2008**
7.1	Install scrubbers on all flues leading from fume hoods in a phased retrofit, as necessary in terms of budget constraints	**Some progress** Dry scrubbers installed at PD Hahn from fume cupboards extraction and at Animal Unit in Chris Barnard Building. Should be the policy for all new buildings or refurbishments but not practical on Medical Campus where existing fume cupboards are all separately extracted.
7.2	Develop an emissions policy, which moves toward zero emissions from laboratories by using less hazardous	There is not an emissions policy directly; however, Hazardous Substance control policies and management guides issued by

	chemical alternatives. Apply the precautionary principle	P&S introduce the concept of looking for less harmful chemical alternatives.
7.3	Install scrubbers (or more effective filters) in the Cissy Gool plaza flues	**Needs site feedback** Current food court cooking extraction canopies already has activated charcoal filters
7.4	Convert Jammie shuttles to lower emissions technology as soon as possible. Use this project for research on the development of prototypes. One type could be a hybrid petrol/natural gas engine, for which the technology already exists in Cape Town	**Good progress** Jammie shuttle vehicles have been upgraded. Noise and emissions form part of contracts. No hybrid or alternative fuel vehicles have yet been piloted.
7.5	Develop park-and-ride schemes, linked into the municipal transport system (Dewar, 2003).	**In progress Aug-Oct 08** Lease of land being is negotiated with CoCT by P&S.
7.6	A car-pooling scheme for UCT staff and students could be co-ordinated via the UCT website	**Good progress** The GCI have launched an innovative web-based scheme called “Ride-link”

4. UCT GREEN CAMPUS ACTION PLAN 2008

This section comprises a table of the priority actions selected though the consultation process for implementation. The table is organised into ten categories, expanding on the four included in the Green Campus Action Framework (Energy, Water, Waste and Carbon Emissions) to include others namely, Landscaping and Biodiversity, Indoor Air Quality, Emissions, Transport, Construction and Institutional Arrangements. These categories are derived from a range of sustainability assessment tools, including the newly launched South African 'Green Star SA' rating system. This sustainability rating system provides specific criteria against which a strategy can be measured, background and technical information, benchmarks, and describes the documentary and other evidence that would demonstrate achievement of the criteria.

In the Strategy column, actions are stated and then qualified by comments or conditions in smaller, italicised text. Responsibilities for implementation are allocated to relevant department; however these responsibilities will need to be refined down to the level of task teams or individuals within departments.

The last column contains the timeframes and where possible and relevant, quantifiable targets. The timeframes range from immediate, short term (2009), medium terms (2-3 years) and longer term (5 years). Progress achieved can be measured against these timeframes and targets; a more detailed monitoring and evaluation framework is to be developed. A review of progress is planned to occur at two year intervals.

These priority actions were selected from the lists contained in these appendices, arranged according to other criteria:

Appendix A: Actions by Sector

Appendix B: Actions by Timeframe

Appendix C: Actions by Type and Cost (i.e. Low cost/Behavioural vs. Capital cost)

	STRATEGY	RESPONSIBILITY	TARGET/DATE
1.0	**ENERGY**		
1.1	Install electricity meters to each building to identify consumption at building level. *Budget for a number of buildings per year? Start with pilot project in Kramer and then Residences to align with GCI/Eskom Energy Challenge and towards use of Residences during 2010 World Cup*	P&S	Commence April 2009 – 2 yr plan
1.2	Establish baseline of electricity consumption per capita and per m ² (global total initially). Identify substantive uses. Set reduction targets. Establish effective monitoring and reporting. *Early data will come from GCI Eskom Energy Challenge in Residences, where meter installations are planned by June 2009*	P&S/ERC/GCU	By March 2009
1.3	Reset all computers under ICTS management, and in all IT labs to energy saving modes. *Start with IT labs*	ICTS/GCU	June 2009
1.4	Launch programme of behaviour change to switch off lights and computers when not in use via raising awareness on Intranet and by posting signage. *Enforce by reporting offenders using Security personnel.*	P&S; Green Campus Unit (GCU)	Commence March 2009
1.5	Install equipment and monitoring systems for gathering and compiling resource use information relayed by electricity (and water) meters. Meters to allow remote data logging.	P&S/ERC	2009-2011
1.6	Replace all magnetic ballasts on fluorescent lights with electronic ballasts. *P&S policy is to replace with electronic ballast and T8 technology ONLY after having physically measured before and after sample to determine energy savings*	P&S	Ongoing OR 2009/10 Adjust timeframe as per funding model
1.7	Install lighting controls (movement sensors, timers, daylight sensors) to selected spaces to activate lighting. *Applicable to all new buildings - some retrofit to be investigated?*	P&S	Ongoing
1.9	Upgrade all Building Management System (BMS) equipment with new technology (web-based system that allows an open protocol and field devices from various suppliers)	P&S	2009-2010

	Initial pilot successful at Kramer Building; next phasing is funds dependant as from the maintenance budget.		
1.10	Install solar water heaters to all small/medium Residences and staff houses in a phased retrofit programme – where practical. *Combining heat pumps with solar water heating requires careful integration of control systems*.	P&S	2009-2011
1.11	Commence a programme of upgrading all HVAC equipment to energy-efficient technology. Negotiate with Eskom/CEF to obtain funding for infrastructure towards 2 MW savings target. *Already underway at Beattie, Menzies and Bremner Buildings. Kramer, Chris Barnard and Barnard Fuller under consideration - but funds-dependant.*	P&S	5 years? *Logistics (HVAC down-time) extends timeframes
1.12	Change cooking methods to gas wherever practical *-to reduce carbon emissions and reduce peak electricity demand (including residence kitchens, food courts)* *-relative costs and logistical factors to be analysed*	P&S	2009-2011
2.0	**WATER**		
2.1	Install water sub-meters to each building to identify leaks and consumption with remote data logging and monitoring.	P&S	3 years
2.2	Establish baseline of water consumption by volume and use (domestic/irrigation); set reduction targets.	P&S	June 2009
2.3	Retrofit all urinals with waterless urinal valves and ensure adequate maintenance (2 yr plan).	P&S	1 -2 years
2.4	Commence a programme of upgrading irrigation to surface drip technology (for planting beds only). *Subject to an investigation to prove water efficiency over conventional systems*	P&S; Gardens Dept.	2-3 years
2.5	Adopt Sustainable Urban Drainage practices including permeable paving to allow infiltration, attenuation (reduce quantity) and enhanced quality of stormwater, (and possible harvesting for irrigation). Install pilot permeable paving area at one or more selected sites. *Research underway within Civil Engineering*	P&S Civil Engineering EGS	

2.6	Ensure adequate dry season flows to maintain natural streams on Upper Campus. *Research required.*	P&S; EGS	Ongoing
2.7	Investigate establishment of 2nd storage dam on Table Mountain property in adjacent tributary *Subject to Specialist research to establish ecological impact*	P&S	2 years
3.0	**INDOOR ENVIRONMENTAL QUALITY**		
3.1	Upgrade ventilation systems to best practice air quality standards for all copy centres, and printing rooms (to ASHRAE standards). *-Substantial funding required; Audit/survey required.*	P&S Campus Copy	3 -5 years
3.2	Minimise all materials containing volatile organic compounds (VOCs) and specify low VOC materials e.g. paint, adhesives and floor coverings. Ensure compliance with Green Star SA Rating system. *This requires some research and in-situ testing on products to check their performance*	P&S;	Ongoing
3.3	Purchase fittings with low or no Formaldehyde emissions e.g. composite wood furniture, plywood, veneers	P&S; Procurement	Ongoing
3.4	Enhance thermal comfort by retrofitting insulation to roofs. Insulation material with the best environmental profile to be selected. *Audit required of where this is most needed.*	P&S; GCU	1-2 yrs
3.5	Retrofit daylight glare and heat control mechanisms to glazing on east and west facades to reduce load on air-conditioning, enhance user comfort and create productive work environments e.g. solar screens, external blinds *Technology for motorising blinds to be investigated- Green Star requires automation with manual override*	P&S	Ongoing
3.6	Adopt standards of ventilation rates and air distribution effectiveness, for all new buildings, that are higher than minimum requirements of the national building code SABS 10400-O.	P&S	2009. Target 50% improvement (Refer Green Star SA)

4.0	**SOLID WASTE**		
4.1	Establish baseline information on waste production by volume and type, by undertaking detailed audits; set reduction targets. Monitor and report annually on trends and progress.	Outsource audit	June 2009
4.2	Establish and monitor a Waste Recycling system for outdoor areas AND within buildings. *GCI Building-to-Building Roadshow to raise awareness and educate*	P&S; GCI	March 2009
4.3	Set up facilities and procedures for the responsible disposal of CFLs and batteries. *A disposal system for Fluorescent tubes is already in place – crushed lamps are disposed of by specialist contractor, managed by P&S*	P&S	Present - 2010
4.4	Set up an E-waste disposal system at strategic points on all campuses.	Procurement & GCI; ICTS	March 2009
4.5	Reduce use of plastic water bottles by introducing alternatives e.g. water dispensers, water filters on taps. Undertake awareness raising campaigns via media, orientation and door-to door.	P&S & GCI	Feb-Nov 2009
4.6	Purchase paper with recycled content, FSC certification and/or chlorine-free. *GCI Building-to-Building Roadshow*	Procurement; Departmental Purchasers	June 2009
4.7	Establish procedures and responsibilities for recycling of printer cartridges. *GCI Building-to-Building Roadshow*	Procurement; ICTS	March 2009
4.8	Reduce and phase out polystyrene in the waste stream, especially food packaging, with a medium-term goal of zero polystyrene at UCT. *Initiate discussions with suppliers of goods and services to UCT.*	P&S/Procurement GCI	2009-2012 3 -4 year plan
5.0	**CARBON EMISSIONS**		
5.1	Continue the Carbon Footprint study, to include Tier 2 emissions (indirect) and complete the further data collection and analysis proposed in the stage 1 Methodology Report	Energy Research Centre	Jun-Sept 2009
5.2	Purchase and hire vehicles that are fuel efficient and have lower emissions. *Include carbon emission reports from suppliers of vehicle rental and airline travel as a standard requirement*	Procurement	2010-

	in future agreements.		
5.3	Develop the use of renewable energy technologies through further pilot schemes *White Paper on Renewable Energy target is 4% by 2013*	P&S; Science Faculty; GCU	Ongoing Target 5% by 2015
6.0	**TRANSPORT**		
6.1	Provide adequate, secure bicycle storage (and shower facilities?) at key locations and at transport hubs. Consider free bike maintenance schemes on campus to encourage cycling – this a student initiative? *GCI to gather data re numbers of cyclists, facilities needed*	P&S Physical Planning GCI	Target - 3% of population by 2012
6.2	Provide dedicated parking for scooters and motorbikes by converting existing vehicle bays – in preferential locations. *Quantity relating to actual present use to be surveyed by GCI*	P&S Physical Planning	Nov 2009
6.3	Develop Park and Ride schemes to limit private vehicle use on campuses. Phase out parking discs for undergraduates. *GCI to assist with awareness raising and buy-in*	P&S GCI	Ongoing
6.4	Promote and support web-based 'Ride-link' car pooling scheme and provide preferential parking/access to encourage multiple occupancy vehicles	GCI & P&S	2009- ongoing
7.0	**EMISSIONS – (TO WATER, AIR AND LAND)**		
7.1	Identify products, run trials of alternative products and implement 'Green Cleaning' programme at UCT.	P&S Supercare	By June 2009
7.2	Reduce the use of pesticides by seeking alternative products and methods, adopting Integrated Pest Management (IPM) principles and complying with the university's IPM Policy document. *Undertake research at UCT towards this aim.*	P&S SHE Unit; Estates dept.; Maintenance Dept; Gardens dept. O&EHR Unit	Ongoing
7.3	Avoid refrigerants and gaseous fire suppression systems with Ozone Depleting Potential (OPD). Specify refrigerants with zero OPD. *Already in practice with respect to Air-Con refrigerants*	P&S	Target: Zero OPD

7.4	Avoid refrigerants with Global Warming Potential (GWP) – aim for GWP of <10	P&S	Target: GWP < 10
7.5	Contain refrigerant leaks to comply with Green Star SA requirements – new buildings and existing central AC systems.	P&S	Ongoing
7.6	Minimise watercourse pollution from stormwater run-off through a range of strategies i.e. infiltration, attenuation, filtration *Undertake a study of current design and develop proposals for pollution control*	P&S Physical Planning; Study by Civil Engineering (Hydraulics)	Ongoing/ aim for first outcomes within 2 yrs- Nov 2009
7.7	Reduce light pollution through considered lighting design to meet requirements of Green Star SA – retrofit and new build *Undertake a study of status quo and develop proposals for retrofitting*	P&S	2009-2011 2 yr plan
7.8	Specify insulation materials with zero ODP, and no loose fibres – ducting; ceiling insulation	P&S	Ongoing
8.0	**CONSTRUCTION**		
8.1	Adopt the Green Star SA rating system and build new buildings to a minimum 4 Star rating *Green Star Office rating system now available; other building types to follow.*	P&S Physical Planning	March 2009
8.2	Issue a Sustainable Design Brief to all consultants including Engineers , with an instruction to design to comply with the Green Star SA rating system (will provide clarity on performance to be achieved)	P&S Physical Planning	2009 - immediate
8.3	Implement and monitor Environmental Management Plans (EMPs) on all construction sites, both new build and major refurbishments	P&S and Independent Environmental Officer? UB&DC	2009 - immediate
8.4	Adopt Sustainable Urban Drainage practices using Green Star requirements to define standards	P&S Physical Planning	Ongoing
8.5	Encourage and support Green Star SA training and accreditation within P&S, project professional teams and even Main Contractors management staff on new buildings	P&S	Ongoing
8.6	Minimise the footprint of parking to conserve land e.g. stacking of parking.	P&S Physical Planning	Ongoing

8.7	Provide the minimum number of car parking spaces to encourage the use of alternative modes of transport i.e. car-pooling, walking, cycling and public transport Refer to guidance in the Green Star Office v1 Technical Manual	P&S Physical Planning	Green Star SA targets
8.7	Adopt a PVC minimisation strategy, including plumbing pipes, electrical cabling and flooring *Alternatives are becoming available for virtually all applications e.g. PEX plumbing pipes, PE, PP*	P&S Physical Planning	2009-2010
9.0	**LANDSCAPING AND BIODIVERSITY/ECOLOGY**		
9.1	Enhance the quality of the estate vegetation to reflect the unique character of the Cape flora and fauna, while respecting planting with heritage value (Upper Campus)	P&S Gardens dept; Physical Planning and Landscape Subcommittee (PPLSC)	Ongoing/annual review
9.2	Enhance biodiversity and ecological value by planting indigenous vegetation and creating habitats to support local fauna and flora	P&S Gardens dept; (PPLSC; Dept. of Botany; GCI; Landscape Architecture Dept.	Ongoing/annual review
9.3	Conserve and enhance the Japonica Walk – Bremner Forest – Glenara greenbelt as per the principles contained in the 2006 UCT Development Framework Plan	P&S Physical Planning Unit; Gardens dept	Ongoing
9.4	Continue the practice of composting landscaping waste to produce mulch on site. Develop composting techniques to achieve faster decomposition and minimise space requirements	P&S Gardens dept	Ongoing
9.5	Reduce the use of chemical fertiliser and optimise the use of organic fertilisers with the aim of improving soil condition	P&S Gardens dept	Over 2 years?
9.6	Plant lawns using water- wise and indigenous, non-invasive grass species , where possible	P&S Gardens dept	Ongoing
9.7	Conserve topsoil on construction sites and protect it while stored to maintain productivity, adopting best practice (Refer Green Star SA Technical Manual for additional guidance)	P&S Gardens dept	Immediate
9.8	Develop and adopt an Upper Campus Forest Management Plan to deal with the replacement of senescent Pine trees, with due consideration to heritage and environmental issues.	UB&DC	2009-2010

9.9	Continue to implement alien vegetation management practices, aiming for continual improvement	P&S Gardens dept	Ongoing
9.10	Propagate indigenous and endemic plants in a nursery for use on site, (with an emphasis on rare species and due cognisance given to planning for Climate Change Partner with (SANBI) Kirstenbosch, TMNP and Department of Botany and GCI	P&S Gardens Dept GCI	2009 and ongoing
9.11	Adjust timing of lawn mowing to allow propagation/seeding of wildflowers *This relates to areas where function allows the growth of longer grasses*	P&S Gardens Dept	Spring 2009
9.12	Ensure amphibian-friendly horticulture practices to protect the threatened (Vulnerable) Cape Rain Frog (Breviceps gibbosus) that is found on Upper, Middle and Lower Campus	P&S Garden Dept	Ongoing
10.0	**INSTITUTIONAL CHANGES**		
10.1	Establish a Green Campus Unit with a director, support staff and students and funding for the first 2/3 years. Develop a long-term funding model ('Green Financing') for sustainability action projects. *Establishment of GCI as a development agency is under consideration (min 1 year project). Working with SRC Vice President to initiate the process.*	VC; Deputy Vice-Chancellor	2009
10.2	Adopt the Green Star SA environmental rating system for all new buildings and major refurbishments. Aim for 4 Star Green Star – 'best practice' *Green Star Office now available; other building types to follow*	P&S Physical Planning UB&DC	2009 - immediate
10.3	Increase skills and capacities within P&S for sustainability programmes e.g. training, CPD, employing a dedicated Energy Officer.	P&S	Ongoing
10.4	Develop and implement a Sustainable Procurement Policy, as part of the overall Procurement Policy, by 2010.	VC; Procurement	2010
10.5	Integrate life cycle costing across UCT's financial decision making processes, with respect to facilities development and maintenance and triple bottom line decision making Needs further discussion and development	VC; DVC; FO; P&S; GCU	2010

10.6	Prepare and disseminate biennial sustainability report that summarises progress and sets agenda for next two years	GCU; DVC; FO; P&S	1st Report in Nov 2010

5. INSTITUTIONAL ARRANGEMENTS

5.1 Role, Structure and Financing of a Green Campus Unit

The institutional arrangements adopted for implementing the Green Campus Action Plan are considered critical to the success of the Action Plan. While some implementation can begin immediately, adequate attention to establishing these arrangements as soon as possible should be considered a priority. These include agreeing on the institutional form of a co-ordinating entity, the clarification of roles and responsibilities and the financing of the Action Plan.

At present, when sustainability interventions are implemented, the funds come from the annual budget allocations of the Properties and Services Department, from either the capital expenditure or maintenance budget, and are thus competing with other priorities such as the maintenance of UCT's assets. The question arises as to whether the budget and responsibility for the implementation of the Green Campus Action Plan should lie with Properties and Services. In addition to budget constraints, there is a lack of capacity to attend to environmental sustainability issues within Properties and Services. The concept of a 'Green Campus Unit' has been proposed and is included in the recently adopted UCT Green Campus Framework 2008.

Clearly, there is the need for coordination of all the actions, across a range of sectors. A number of departments other than Properties and Services, as well as the student body, the Green Campus Initiative (GCI), have been allocated responsibility for the implementation of actions, including ICTS, Gardens Department and Procurement. The wide geographical spread of UCT's campuses adds to the need for coordination by a dedicated unit.

To achieve success, the Plan must remain flexible, responding to available resources and shifting priorities and will therefore need periodic review. It is proposed that this coordination role be undertaken by a Green Campus Unit, similar to that established at Harvard - the Harvard Office for Sustainability. A concept for such a unit within the context of UCT needs to be further debated and developed. Some members of the UCT community advocate the integration of sustainability into all existing institutional structures, rather than the creation of a new entity. It is also possible that a combination of both approaches is adopted, where a Green Campus Unit would have a role limited to advocacy and behavioural change.

5.2 The Role of a Green Campus Unit (GCU)

The alternative of a dedicated sustainability unit needs to be fully debated through an inclusive participation process. Without pre-empting this process, it is envisaged that a key role of the GCU would be the coordination and monitoring of the Green Campus Action Plan. The GCU would provide oversight for implementation of the greenhouse gas reduction goal; launch and drive behavioural change programmes such as improving efficiency measures in buildings, sustainable procurement practices and improved waste reduction. The unit may become involved in a variety of projects and programmes with support from the departments e.g. renewable energy projects, promotion of biodiversity in

landscaping, providing technical support for waste reduction, and providing environmental education programs.

Responsibility for operation and maintenance of facilities must remain with Properties and Services, while the GCU might undertake pilot projects. The GCU would provide input to environmental aspects of the universities operations through its committee forum where facilities management personnel would participate. A key concern is the possible overlap of functions of the GCU and UCT administrative functions/departments such as Properties and Services, Procurement, and ICTS. As envisaged, the present functions of the Properties and Services would not fundamentally change; however the GCU may influence the way things are done. The staff of Properties and Services would work closely with the GCU and serve on the GCU Committee, holding those portfolios according to their departmental line functions, for example, Waste Management, Transport, Procurement and Energy.

The role envisaged for the Green Campus Unit, as described in the Green Campus Framework, would go beyond actions relating to the facilities development and operations of the campus, to include research and education:

- *Develop the use of UCT as a living laboratory for educational purposes*
- *Develop educational programs that will achieve campus environmental impact reduction*
- *Research to advise procurement and energy saving incentives*

Thus, in addition to coordinating actions relating to the campus operations, the Green Campus Unit would aim to mainstream and integrate environmental sustainability issues into curriculum across all faculties at UCT. It would also provide a forum where students, academic and administrative staff could engage with each other on environmental issues.

The student body, the Green Campus Initiative, has a key role to play in the implementation of the Green Campus Action Plan, particularly where actions relate to behavioural change, and raising awareness. The GCI have a programme of action that is already being implemented and has achieved a number of successful projects. An effort was made in Phase 1 of this project to align the Action Plan with the GCI programme; however ongoing coordination will be required.

5.3 The Structure of a Green Campus Unit

It is proposed that the Unit be established as an independent unit, with a Director and two Chairs, representing academic and faculty staff members. The support of the leadership would be represented by the Vice Chancellor or a Deputy- Vice Chancellor. Administrative staff, based in departments such as Properties and Services, would be responsible for matters such as Waste Management, Energy and Procurement. Projects or programs could be undertaken by students in paid or unpaid research positions or Internships to the Unit.

The Director would develop the vision and roles of the Green Campus Unit and be responsible for the development and implementation of different programs. The Director should research and develop the vision and roles of the Green Campus Unit for the first year in close association with the Chairs and Green Campus Initiative. As the programs develop and funding allows, additional staff members can be appointed by the Unit.

The student arm of the Green Campus Unit -the Green Campus Initiative- would work closely with the Green Campus Unit and a Student Chair position is envisaged. The students would participate on a voluntary basis. Establishment of the GCI as a development agency is under consideration at present. The GCI are working with Student Representative Council Vice President at present to initiate the process.

The basic requirements for such a unit would be a full-time or part-time Director, funding for the first three years, and an office with adequate space for the growth of the unit.

5.4 Financing of a Green Campus Unit

At present, ideas about how to finance campus greening at UCT are very conceptual. A workshop is planned in February 2009 to discuss options and green financing models. Thereafter, these initial ideas would be taken to the university administration for further discussion and approval. The precedent provided by the Harvard "Green Campus Loan Fund" (see Box below) is a model that may be a starting point for UCT.

The responsibility for many of the actions contained in the Action Plan lie with the Properties and Services Department, since the actions involve the design, construction and maintenance of the facilities, which is the core function of that department. However, when the cost of the sustainability intervention is higher than a conventional solution, it can become difficult to justify the additional expenditure, unless the sustainability agenda is being prioritised. It is proposed that funds for certain actions could be obtained by departments from a central fund, a "Green Campus Fund", as a loan that is paid back from the savings generated through resource efficiency projects.

It is envisaged that ultimately the energy saving reductions developed and implemented by the Green Campus Unit would pay for the running of the unit, making it largely self-sustainable. Start-up funding may be required for the first few years, which could be sought from UCT central finance, government or the private sector. Responsibility for the administration of the funds, in the context of UCT's existing structures, is one of the key institutional arrangements as yet to be developed.

5.5 Reporting on Progress of the Action Plan

Monitoring and measurement are required to test for progress in implementing the environmental objectives and targets. Documented evidence of performance will need to be provided. The actions can be measured against the targets where they exist, or a more qualitative description of progress on objectives could be provided.

Some procedures for managing a lack of performance against targets will be required. These need to be structured to a degree, for example, monthly reporting to EMWG, at the Properties and Services EXCO meetings; or the regular meetings of the Green Campus Unit, if established.

Record keeping and making data accessible are important for monitoring the Action Plan, for example, data on water and electricity consumption and waste production. This kind data is at present not easily accessible or being gathered in a way that can inform resource conservation. The method of data collection and reporting thereof should be planned and formalised, taking advantage of available technological solutions. For example, providing water and energy consumption data in graphic format on the Intranet and Internet or on electronic notice boards is likely to influence behaviour. In addition to the community, these records should be easily accessible to auditors.

It is proposed that reporting on progress against the Action Plan occurs every two years and this reporting then sets the agenda for the next two years. The Green Campus Unit, if it is established as proposed, would coordinate the monitoring and reporting and contribute to the process by ongoing information gathering. A review of the Plan at regular intervals would ensure its continued suitability and effectiveness. The review should address the changes to objectives and targets and introduce new strategies where these become available. Further development and refinement of targets may be required on an ongoing basis, reflecting the changing context. The targets should be reset to achieve continual improvement.

Financing Campus Greening at Harvard University

The Harvard Office for Sustainability receives 20% of its funding from Harvard University's central funding. The remaining funding is generated by fees for services to partnerships that the unit negotiates annually with a variety of Harvard's departments. Through these partnerships, many departments access expertise to generate cost effective, green campus projects including building design and operations, procurement, behavioural change and energy conservation projects. Partnership agreements emphasize the generation of project savings to justify the investment in the fees for project support. The University has also established a $12 million revolving, interest-free loan fund, the Green Campus Loan Fund, to support projects that reduce the consumption of energy and other resources.

The Harvard Green Campus Loan Fund provides capital for high performance campus facility design, operations, and maintenance and occupant behaviour projects. Project eligibility guidelines state that projects must reduce the University's environmental impacts such as greenhouse gas reductions, energy and water conservation. The loan supports both existing building refurbishment and new construction, including renewable energy projects.

Source: www.greencampus.harvard.edu

5.6 The Way forward

The following activities are proposed as a point of departure:

1. Define and allocate roles and responsibilities for implementing actions in more detail
2. Define and agree on reporting mechanisms
3. Start implementing selected Actions
4. Undertake planning for medium term Actions
5. Seek funding for capital intensive Actions
6. Report to the UCT community about this plan and seek consensus on the institutional arrangements and financing

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SABS/Standards South Africa	www.stansa.co.za/
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UK Carbon Trust	www.carbontrust.co.uk/

APPENDIX A

ACTIONS BY SECTOR

ENERGY

- Establish **baseline of consumption** (per capita; kWh/m²/annum) and set targets for reduction
- Install digital **electricity meters** to each building to identify consumption.
- Retrofit all lights with most efficient lamps and electronic ballasts. Replace all incandescent lamps.
- Replace all magnetic ballasts on fluorescent lights with electronic ballasts.
- Launch programme of behaviour change to switch off lights and computers when not in use via Intranet and by posting signage. Enforce by reporting offenders using security personnel.
- Reset all computers under ICTS management, and in all IT labs to energy saving modes.
- Install efficient panel heaters to selected rooms on an application basis to replace bar and oil heaters; enforce via Security and H&S personnel.
- Upgrade all BMS equipment with new technology to enhance energy management.
- Install movement sensors to selected spaces to activate HVAC and lighting.
- Retrofit insulation to AC and hot water pipes with approved insulation
- Adopt 'Displacement' ventilation in place of 'Mixing' ventilation mode for HVAC.
- Minimise electric lighting levels and introduce task lighting where applicable.
- Reduce Peak energy demand through a range of strategies e.g. internal demand management, load-shedding, renewable energy
- Install solar water heaters to all Residences in a phased retrofit programme.
- Commence a (10 yr) programme of upgrading all HVAC equipment to energy-efficient technology.
- Commence a (5-10 yr) programme of replacing all old lifts with new, energy efficient technology.
- Develop a range of renewable energy sources (wind, solar, biomass) and install pilot projects, with research component wherever possible. Target 5% renewable energy within 10yrs?
- Phase in LCD computer screens, and laptops to reduce energy consumption.
- Consider and evaluate suitability of on-site co-generation energy plants for new buildings.
- Review and enforce Air-conditioning policy and communicate widely.

WATER

- Establish baseline of consumption by volume and use; set targets for reduction of potable water use.
- Install digital water sub-meters to each building to identify leaks and consumption.
- Install water efficient fittings to all new buildings and major refurbishments.
- Retrofit existing buildings with waterless urinals, flow reducing spray taps and shower heads and dual / low flush toilet mechanisms.
- Retrofit all existing urinals with waterless urinal valves and ensure adequate maintenance (2 yr plan).

- Install surface drip irrigation to all planting beds.
- Research harvesting of run-off and rainwater for use in irrigation
- Continually improve leak reporting service and response times.
- Monitor and publish water consumption data

WASTE

- Establish baseline of waste produced by volume and type; set targets for reduction.
- Establish recycling at source system for outdoor areas and within buildings.
- Establish recycling at source within Residences.
- Establish procedures and responsibilities for recycling of printer cartridges.
- Set up facilities and procedures for the responsible disposal of CFLs, Fluorescent lamps and batteries.
- Set up e-waste disposal system at strategic points on all campuses
- Reduce use of plastic water bottles by introducing alternatives e.g. water dispensers, water filters on taps.
- Purchase paper with recycled content, FSC certification and/or chlorine-free.
- Establish system for recycling office paper. Target 80%
- Reduce and phase out polystyrene in the waste stream, especially food packaging, with a medium-term goal of zero polystyrene at UCT.

INDOOR ENVIRONMENTAL QUALITY (IEQ)

- Adopt standards of ventilation rates and air change effectiveness that are higher than minimum requirements required by building code; test and upgrade as necessary?
- Upgrade ventilation systems to high air quality standards for all copy centres, and printing rooms. (to ASHRAE standards)
- Retrofit daylight glare and heat control to east and west glazing e.g. solar screens
- Enhance thermal comfort by retrofitting insulation to roofs
- Avoid all materials containing Volatile Organic Compounds (VOCs) E.G. paints, adhesives and floor coverings. Ensure compliance with Green Star SA Rating system.
- Purchase products with low or no Formaldehyde emissions e.g. composite wood furniture

LANDSCAPING, LAND USE AND ECOLOGY

- Enhance biodiversity and ecological value by planting endemic vegetation and creating regenerative habitats
- Continue practice of composting landscaping waste to produce mulch on site.
- Phase out use of chemical fertiliser and introduce organic fertilisers
- Plant Sports fields and lawns with water- wise, indigenous, non-invasive grass species
- Phase out invasive grass species (Kikuyu) and change to indigenous species
- Conserve topsoil on construction sites, adopting best practice

TRANSPORT

- Provide adequate, secure bicycle storage and shower facilities (e.g. 5% of population) at key locations and at transport hubs.
- Develop Park and Ride schemes to limit private vehicle use on campus
- Promote and support 'Ride-link' car pooling scheme and preferential parking for MOVs
- Provide dedicated parking for scooters and motorbikes using existing vehicle bays.
- Pilot hybrid vehicles and alternative fuel vehicles
- Develop Non-motorised Transport routes

CAFETERIAS, FOOD OUTLETS

- Change cooking methods to gas where applicable
- Reduce and phase out polystyrene packaging and food containers
- Introduce local and organic produce to Residences, Cafeterias and Food courts
- Promote healthy eating

CONSTRUCTION

- Issue a Sustainable Design Brief to all consultants including Engineers
- Build to 4 Star Green Star SA rating
- Implement and monitor EMPs on all construction sites
- Adopt Sustainable Urban Drainage practices – attenuation, filtration
- Specify water efficient fittings
- Adopt Displacement ventilation in lieu of Mixing ventilation
- Encourage and support Green Star SA Accreditation within P&S
- Include HVAC commissioning clauses in all professional appointments
- Appoint professional to undertake building tuning on new builds
- Appoint independent commissioning agents for new builds
- Provide Building User Guides including environmental issues
- Undertake waste management on construction sites, including recycling
- Specify materials to improve PVC minimisation – pipework and ducting

PURCHASING

- Purchase FSC and chlorine/acid- free paper
- Develop and adopt a Sustainable Procurement Policy
- Purchase or hire vehicles that are fuel efficient and have low emissions
- Give preference to airline companies that have carbon emissions polices

EMISSIONS – to air, water, land

- Carbon emissions
- NOx emissions e.g. Anaesthesia

- Develop Renewable energy sources
- Minimise use of herbicides and pesticides
- Manage Hazardous Waste
- Hazardous materials
- Minimise GMOs
- Radioactive materials
- Discharge to Sewerage
- Avoid refrigerants with Ozone Depleting Potential (OPD)
- Avoid refrigerants with Global Warming Potential (GWP)
- Address refrigerant leaks
- Watercourse pollution – stormwater run-off
- Light pollution
- Legionella
- Use insulation with zero ODP
- Biodegradable, phosphate free cleaning chemicals

APPENDIX B

ACTIONS BY TIMEFRAME

SHORT TERM – IMMEDIATE – (1-3 YRS)

1. Establish recycling at source system for outdoor areas and within buildings.
2. Install digital electricity meters to each building to identify consumption.
3. Purchase paper with recycled content, FSC certification and/or chlorine-free.
4. Retrofit all urinals with waterless urinal valves
5. Reduce use of plastic water bottles by introducing alternatives e.g. water dispensers, water filters on taps.
6. Launch programme of behaviour change to switch off lights and computers when not in use via Intranet and by posting signage. Enforce by reporting offenders using security personnel.
7. Reset all computers under ICTS management, and in all IT labs to energy saving modes.
8. Set up facilities and procedures for the responsible disposal of CFLs, Fluorescent lamps and batteries.
9. Provide adequate, secure bicycle storage and shower facilities (e.g. 5-10% population) at key locations and at transport hubs.
10. Provide dedicated parking for scooters and motorbikes using existing vehicle bays.
11. Establish procedures and responsibilities for recycling of printer cartridges
12. Reduce and phase out polystyrene in the waste stream, especially food packaging, with a medium-term goal of zero polystyrene at UCT.
13. Set up e-waste disposal system at strategic points on all campuses.
14. Retrofit all fluorescent lighting with electronic ballasts.

MEDIUM (3-5 YRS)

1. Install efficient panel heaters to selected rooms on an application basis to replace bar and oil heaters; enforce using security and H&S personnel.
2. Provide secure bicycle storage and shower facilities
3. Install digital water sub-meters to each building to identify leaks and consumption.
4. Install equipment and monitoring systems for gathering, compiling and displaying resource consumption data relayed by electricity and water meters.
5. Install Solar water heaters to all Residences in a phased retrofit programme.
6. Upgrade all BMS equipment with new technology.
7. Upgrade ventilation systems to high air quality standards for all copy centres, and printing rooms. ASHRAE)
8. Install movement sensors to selected spaces to activate HVAC and lighting

LONG-TERM (5-10 YRS)

1. Commence a (10 yr) programme of upgrading all HVAC equipment to energy-efficient technology.
2. Commence a (5 yr) programme of upgrading irrigation to surface drip technology
3. Commence a (5-10 yr) programme of replacing all old lifts with new, energy efficient tech.

APPENDIX C

ACTIONS BY TYPE AND COST

A. LOW COST or BEHAVIOURAL ACTIONS

1. Establish recycling at source system for outdoor areas and within buildings.
2. Retrofit all urinals with waterless urinal valves and ensure adequate maintenance (2 yr plan).
3. Reduce use of plastic water bottles by introducing alternatives e.g. water dispensers, water filters on taps.
4. Launch programme of behaviour change to switch off lights and computers when not in use via Intranet and by posting signage. Enforce by reporting offenders using security personnel.
5. Reset all computers under ICTS management, and in all IT labs to energy saving modes.
6. Set up facilities and procedures for the responsible disposal of CFLs, Fluorescent lamps and batteries.
7. Purchase paper with recycled content, FSC certification and/or chlorine-free.
8. Purchase and hire vehicles that are fuel efficient and have low emissions
9. Establish procedures and responsibilities for recycling of printer cartridges.
10. Provide adequate, secure bicycle storage and shower facilities (e.g. 5% of population) at key locations and at transport hubs.
11. Provide dedicated parking for scooters and motorbikes using existing vehicle bays.
12. Set up e-waste disposal system at strategic points on all campuses.
13. Install efficient panel heaters to selected rooms on an application basis to replace bar and oil heaters; enforce via Security and H&S personnel.
14. Reduce and phase out polystyrene in the waste stream, especially food packaging, with a medium-term goal of zero polystyrene at UCT.
15. Improve pedestrian and cycle access routes to campuses, providing safety, security e.g. safe access of N2 route
16. Establish baseline of water, waste and electricity consumption by volume and use; set reduction targets.
17. Identify, trial and implement 'Green Cleaning' programme at UCT.

B. CAPITAL COST ACTIONS

1. Install digital electricity meters to each building to identify consumption.
2. Install digital water sub-meters to each building to identify leaks and consumption.
3. Install equipment and monitoring systems for gathering and compiling resource use information relayed by electricity and water meters.
4. Replace all magnetic ballasts on fluorescent lights with electronic ballasts.
5. Install solar water heaters to all Residences in a phased retrofit programme.
6. Upgrade all BMS equipment with new technology.
7. Upgrade ventilation systems to high air quality standards for all copy centres, and printing rooms. (to ASHRAE standards)
8. Install movement sensors to selected spaces to activate HVAC and lighting.

C. LONG-TERM PLANNED (MAINTENANCE) PROGRAMMES

1. Commence a (10 yr) programme of upgrading all HVAC equipment to energy-efficient technology.
2. Commence a (2-5 yr?) programme of upgrading irrigation to surface drip technology
3. Commence a (5-10 yr) programme of replacing all old lifts with new, energy efficient tech.

D. INSTITUTIONAL CHANGES

1. Establish a Green Campus Unit with a director, support staff and students and funding for the two years. Develop a long-term funding model (Green financing).
2. Adopt the SA Green Star environmental rating system for all new buildings and major refurbishments.
3. Increase capacities within P&S for sustainability programmes e.g. employ a dedicated Energy Officer.
4. Develop and implement a Sustainable Procurement Policy by 2010.
5. Integration of life cycle costing across UCT's financial decision making processes
6. Prepare a Sustainability Report every two years and set the agenda for the next two years

APPENDIX D

LEGISLATION AND POLICY – Relevant to Environmental Management at UCT

1. LIST OF RELEVANT ENVIRONMENTAL LEGISLATION

Note: The asterisk * denotes legislation and policy included in this UCT Green Campus Action Plan 2008, while the balance is included in the 2003 *Initial Review towards and EMS* Report.

		Year
	INTERNATIONAL	
	Vienna Convention for the Protection of the Ozone Layer	1985
	Montreal Protocol	1987
	Convention on Biological Diversity	1992
	Kyoto Protocol	1992
	United Nations Framework Convention on Climate Change	1994
	Cartegena Protocol	2000
*	Bali Accord on Climate Change	2007
	SOFT LAW	
	Talloires Declaration 1990	1990
	Agenda 21	1992
	Stockholm Convention on Persistent Organic Pollutants, 2001	2001
	Johannesburg Plan of Implementation (JPOI)	2002
	NATIONAL	
	Atmospheric Pollution Prevention Act 45 of 1965	1965
	Hazardous Substances Act 15 of 1973	1973
	Health Act 63 of 1977	1977
	Conservation of Agricultural Resources Act 43 of 1983	1983
	Environmental Conservation Act	1989
	Road Traffic Act 29 of 1989	1989
	Occupational Health and Safety Act 85 of 1993	1993
	Constitution of the Republic of South Africa, Act 108 of 1996	1996
	Genetically Modified Organisms Act 15 of 1997	1997
	National Environmental Management Act, Act 107 of 1998	1998
	National Veld and Forest Fire Act 101 of 1998	1998
	National Water Act 36 of 1998	1998
	GMO Regulations 1999	1999
	National Heritage Resources Act 255 of 1999	1999
	National Veld and Forest Fire Amend. Act 12 of 2001	2001
	National Environmental Management Amendment Act, Act 56 of 2002	2002
*	National Environmental Management: Biodiversity Act 10 of 2004	2004
*	National Environmental Management: Air Quality Act 39 of 2004	2004

*	NEMA: Environmental assessment Regulations 2006	2006
*	National Energy Act 34 of 2008	2008
	DRAFT NATIONAL	
*	National Environmental Management: Waste Management Bill 2007	2007
*	Renewable Energy Feed-in Tariff and Incentives Bill 2008	2008
	POLICY	
	White Paper on Integrated Pollution and Waste Management 2000	2000
	National Waste Management Strategy	
	Polokwane Declaration on Waste Management 2001	2001
*	White Paper on Renewable Energy Policy 2004	2004
*	National Climate Change Response Strategy	2004
*	Energy Efficiency Strategy of the Republic of South Africa	2005
*	National Framework for Sustainable Development (NFSD) 2008	2008
	PROVINCIAL	
*	Sustainable Development Implementation Plan	2007
*	A Climate Change Strategy and Action Plan	2007
*	Western Cape Sustainable energy Strategy and Programme of Action 2008	2008
	LOCAL	
	City of Cape Town Air Pollution Control By-Law 2003	2003
*	City of Cape Town Air Quality Management Plan 2005	2005
*	City of Cape Town Energy and Climate Change strategy 2006	2006
	BEST PRACTICE STANDARDS	
	US Green building Council LEED Green Building Rating system	
	UK BREEEAM Green Building Rating System	
	SA CSIR Sustainable Building Assessment Tool	
	BRE Green Guide to Specification	
*	South African National Standard SANS 204 Energy Efficiency in Buildings 2008	2008
*	Green Star SA Office Design & Office As Built Version 1 2008	2008

2. LEGISLATION AND POLICY 2003-2008

International Agreements/Policy

- The Bali Accord on Climate Change 2007

National Legislation

- National Environmental Management: Biodiversity Act, No 10 of 2004
- National Environmental Management: Air Quality Act (AQA), No 39 of 2004
- National Environmental Management: Environmental Assessment Regulations 2006
- National Energy Act, No 34 of 2008

Other Relevant Policy

- National Climate Change Response Strategy 2004
- White Paper on Renewable Energy Policy 2004
- Energy Efficiency Strategy of the Republic of South Africa 2005
- National Framework for Sustainable Development (NFSD) 2008

Draft National Legislation

- National Environmental Management: Waste Management Bill 2007
- Renewable Energy Feed-in Tariff and Incentives Bill 2008

Provincial Policy

- Sustainable Development Implementation Plan (SDIP) 2006
- Western Cape Sustainable Energy Strategy and Programme of Action March 2008
- A Climate Change Strategy and Action Plan for the Western Cape March 2008

Local Authority

- Air Quality Management Plan 2005
- City of Cape Town Energy and Climate Change Strategy 2006

Best Practice Standards

- Green Star SA – Office v1 Rating Tool 2008
- South African National Standard: SANS 204 Energy Efficiency in Buildings 2008

<u>International policy</u>

The Bali Accord on Climate Change 2007

Internationally, there has been progress towards commitment to climate change policies, most significantly Europe's proposed climate change policy for 2013-20. Nearly 200 nations agreed at U.N.-led talks in Bali in December 2007 on a "roadmap" for two years of negotiations to adopt a new treaty to succeed the Kyoto accord beyond 2012. The package of measures proposed by the

European Commission would set 2020 targets to cut greenhouse emissions to 20% below 1990 levels, produce 20% of power from renewable sources and ensure 10% of transport fuels come from biofuel sources. EU leaders must approve the overall approach and also agree how to share its burdens around its 27 member nations. The Bali roadmap deadline for a new global climate agreement is December 2009. Presently, the Kyoto accord binds all industrial countries except the United States to cut emissions of greenhouse gases between 2008 and 2012. The new negotiations will seek to bind all countries to emission curbs from 2013.

National

National Environmental Management: Biodiversity Act, No 10 Of 2004

The main objectives of the Biodiversity Act are to manage and conserve South Africa's biological diversity, to protect species and ecosystems, to provide for the sustainable use of indigenous biological resources and for the fair and equitable sharing of benefits derived from such resources, as well as the establishment of the South African National Biodiversity Institute (SANBI).

The Biodiversity Act must be applied and implemented within the framework of NEMA, and accordingly must be guided by the NEMA principles where relevant. Under this Act, the Minister must prepare and adopt a national biodiversity framework, which is the primary planning instrument provided for under this legislation. The framework must provide for an integrated, co-ordinated and uniform approach to biodiversity management by organs of state in all spheres of government. Furthermore, the Minister or the MEC for environmental affairs in a province may determine a geographic region as a bioregion, if that region contains whole or several nested ecosystems, and is characterized by its landforms, vegetation cover, human culture and history.

The local government may be designated as the authority tasked with issuing permits for the undertaking of restricted activities in respect to listed species, invasive or alien species, or bio-prospecting. Section 76(2) requires that Municipalities prepare an invasive species monitoring, control and eradication plan for land under their control, as part of their IDP environmental plans.

A municipality must align their Integrated Development Framework (IDP) within the national biodiversity framework and any applicable bioregional plans and demonstrate how these plans will be implemented by the municipality. The IDP must take into account the need for protection of listed ecosystems, therefore the various bioregional plans that are applicable to the Western Cape include: The Cape Action for People and the Environment (C.A.P.E.), The Subtropical Thicket Ecosystem Programme (STEP), The Succulent Karoo Ecosystem Programme (SKEP), and The National Spatial Biodiversity Assessment (NSBA).

Threatened and Protected Species Regulations were published and took effect on 1 June 2007.

Implications for UCT

UCT should align its approach to enhancing the diversity of species on its campuses with bioregional plans such as C.A.P.E. There are some red data species at UCT, which should be dealt with in a manner compliant with the Threatened and Protected Species Regulations.

Research at UCT involving listed, threatened or protected species and bio-prospecting would require an application for a permit.

The requirement to eradicate invasive alien species where they may harm ecosystems of habitats has applicability to fauna and flora, particularly in areas bordering on the Table Mountain National Park.

National Environmental Management: Air Quality Act (AQA), No 39 Of 2004

The Air Quality Act regulates air quality in order to protect the environment. It provides measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development, while promoting justifiable economic and social development. The Act further provides for national norms and standards regulating air quality monitoring, management and control by all spheres of government.

The Act seeks to enhance the quality of the ambient air for the sake of securing an environment that is not harmful to the health and well-being of people. Atmospheric emissions such as ozone-depleting substances and greenhouse gases have detrimental effects on the environment, both globally and locally.

The Act provides for the establishment of a national framework, and implementation, planning, coordination, and enforcement of management measures including by licensing listed activities. It Act confers substantial powers on local government to administer the licensing system in accordance with the executive competence of local government for air pollution. Each municipality must include in its IDP an air quality management plan. This plan must seek to give effect to NEMA, to improve air quality, and address effects of emissions from the use of fossil fuels in residential applications and industrial resources. In terms of the Act, the local government is required to appoint an air quality officer, prepare an air quality management plan and implement atmospheric emission license systems.

Implications for UCT

Pollutants discharged into the atmosphere from laboratories or other facilities may require emission licenses in terms of this law.

UCT's Transport policy should take cognizance of the future tightening of control of vehicle emissions.

National Environmental Management: Environmental Assessment (EA) Regulations 2006

The EA Regulations regulate procedures and criteria contemplated in Chapter 5 of the National Environmental Management Act (NEMA) for the submission, processing, consideration and decision of applications for environmental authorization of activities.

The NEMA EA Regulations have replaced the previous EA Regulations promulgated under the Environment Conservation Act, 1989. These Regulations were published in Government Notices

R.385, R.386 and R.387 in 2006 and came into effect on 3 July that year, however, the provisions in relation to mining and prospecting activities have not yet come into effect.

The EA Regulations aim to address the lack of clarity that was experienced with the previous EA Regulations, streamline the EA process, provide more specific requirements for public participation and improve the content, quality and independence of EA Reports. In addition, timeframes for authorities have been stipulated for the various processes.

The most significant difference between the ECA regulations and the NEMA EA Regulations is the separation of listed activities into two categories, the first list requiring the applicant to undertake a basic assessment, whilst the second list requires the applicant to undertake scoping and an EIA. The requirements for such environmental assessments are detailed in Chapter 3 of the regulations.

The NEMA EA Regulations also provide for the amendment of an Environmental Authorisation (formerly a Record of Decision), lodging of an appeal against the granting of, or refusal to grant, an environmental authorisation, exemption of applicants from certain requirements and the withdrawal of environmental authorisations.

Implications for UCT

Due to UCT's unique property rights granted by Rhodes Will Act 9 of 1910, development within the original Groote Schuur estate will not be subject to Environmental Assessment under this Act. However, it may elect to undertake such assessment where significant environmental impacts are anticipated, in particular for large scale developments. Heritage and visual impacts would have particular relevance in this historic estate.

The NEMA EA Regulations now include requirements for Environmental Management Frameworks (EMFs) to be developed by the provincial government for geographic areas, aimed at promoting more strategic decision-making. These EMFs must contain information about the status and attributes of the particular geographical area, and the environmental management priorities of the area must be taken into consideration when deciding environmental authorizations. UCT will need to align campus development plans with the Municipal Spatial Development Frameworks within EMFs.

National Energy Act 34 of 2008

The Act aims to ensure that diverse energy resources are available, in sustainable quantities and at affordable prices, to the South African economy in support of economic growth and poverty alleviation, taking into account environmental management requirements and interactions amongst economic sectors. It provides for energy planning, increased generation and consumption of renewable energies, contingency energy supply, holding of strategic energy feedstocks and carriers and adequate investment in and upkeep of energy infrastructure.

The Act establishes an institution, the South African National Energy Development Institute (formerly SANERI), which will be responsible for the promotion of efficient generation and consumption of energy and for energy research[2].

The core functions of this Institute include energy research and development in all fields of energy, other than nuclear energy; the promotion of energy research and technology innovation; and provision of training and development in the field of energy research and technology development.

Implications for UCT

Of particular relevance to research at UCT, the Institute is required to establish facilities for the collection and dissemination of information in connection with research, development and innovation; promote relevant energy research through cooperation with any entity, institution or person equipped with the relevant skills and expertise; make grants to educational and scientific institutions in aid of research or for the establishment of facilities for such research; and promote the training of research workers by granting bursaries or grants-in-aid for research.

The rights in all discoveries and inventions by persons to whom contracts, including bursaries or grants-in-aid, have been granted by the South African National Energy Development Institute, vests in the South African National Energy Development Institute.

Current thematic areas for the funding of fundamental and applied research to:

- Energy Efficiency and Demand Side Management
- Cleaner Fossil Fuels
- Stimulating Socio-economic Development through the Productive Use of Energy
- Renewable Energy
- Alternative Energy (mainly Fuel Cells and the Hydrogen Economy)
- Understanding the Impact of Energy Use on the Environment
- Energy Modelling and Planning
- Energy Policy Research

Other Relevant Policy

National Climate Change Response Strategy 2004

In order to fulfil the requirements of the United Nations Framework Convention on Climate Change (UNFCCC), South Africa has prepared an Initial National Communication to the UNFCCC, completed in 2000. In addition, detailed South African Country Studies reports have been compiled on a

[2] SANERI was established by the Minister of Minerals and Energy in October 2004, as a subsidiary of CEF (Pty) Ltd, the state energy company in South Africa, with the Department of Science and Technology and the DME, as joint custodians. From the date of commencement of the Energy Act, SANERI and the National Energy Efficiency Institute (NEEA) become a single body - the South African National Energy Development Institute, due to become active during 2009.

sectoral basis. Using the results of this work, together with information from the IPCC Third Assessment Report, the Department of Environmental Affairs and Tourism has developed a National Climate Change Response Strategy, approved by the Cabinet In October 2004.

The strategies outlined in the document address issues that have been identified as priorities for dealing with climate change in South Africa. While the national Strategy recognises international realities, including the growing pressure for quantified commitments of some kind by developing countries, including South Africa, these are considered within the context of the present economic realities of the country. The aim of the Strategy is achievement of national and sustainable development objectives, whilst simultaneously responding to climate change. The Strategy highlights the following as key issues and problems:

- Supporting national and sustainable development
- Adapting to Climate Change
- Developing a sustainable energy programme
- Climate change related education and training
- Research development and demonstration
- Inventories of greenhouse gases and air pollutants

Climate change could undermine global poverty alleviation efforts and have severe implications for food security, clean water, energy supply, environmental health and human settlements. It will thus be necessary to carry out adaptation measures in this country. The South African Country Studies Programme identified the health sector, maize production, plant and animal biodiversity, water resources, and rangelands as areas of highest vulnerability to climate change and these areas need to be targeted for adaptation measures. Further, adaptation measures may require the development and implementation of low greenhouse gas emitting technologies and waste strategies, localisation of production, creation of sustainable and adaptable livelihoods, benchmarks and targets for progress to a less carbon and energy intensive economy.

Implications for UCT

While the Strategy is aimed at government and its associated institutions, it calls for the total involvement of the private and non-governmental sectors - if it is to represent a truly national course of action.

The project being undertaken by the Energy Research Centre at UCT to measure the carbon footprint of the university is the first step towards climate change mitigation. The Green Campus Action plan, once implemented, will reduce carbon emissions through energy management, waste minimisation and a range of measures.

White Paper on Renewable Energy Policy 2004

This policy document produced by the Department of Minerals and Energy (DME) is intended to give a much needed thrust to renewable energy. The policy envisages a range of measures to bring about integration of renewable energies into the mainstream energy economy. The national target for energy from renewable sources is 10 000 GWh/yr in 2013 (approximately 4% of projected electricity demand for 2013) to be produced mainly from biomass, wind, solar and small-scale hydro. The renewable energy is to be utilised for power generation and non-electric technologies such as solar water heating and bio-fuels. This target is due for a 5 year review in 2008.

The National target for energy from renewable sources is 10 000 GWh/yr in 2013.

In furthering this policy, the Department of Minerals and Energy (DME), together with the Development Bank of Southern Africa (DBSA), has established a renewable energy market transformation programme (REMT) to assist investors in overcoming some of the obstacles and barriers preventing growth in the renewable energy sector.

Some $8,3-million in funding has been made available for the programme[3]. The fund would assist the DME in reaching its target of 10 000 GWh of electricity to be generated from renewable sources by 2013. The REMT would not actually finance investments, but would rather assist with feasibility studies, for example. The project's objectives are to remove the barriers and reduce the implementation costs of renewable energy technologies, and also to promote on-grid electricity from renewable energy sources. The programme has two specific focus areas, firstly the promotion of renewable energy generation to be incorporated into the grid, and secondly, a strong commercial solar water heating push, as solar water heating has up until now, been largely focused on the domestic market.

Implications for UCT

UCT could investigate options for financing from the DME for on-site renewable energy generation and solar water heating for the residences.

Energy Efficiency Strategy of the Republic of South Africa 2005

The Energy Efficiency Strategy was approved by Cabinet in March 2005 and sets the target for improved energy efficiency in South Africa at 12% by 2015[4]. The key objective is the development and implementation of energy efficiency practices. The Strategy takes its mandate from the White Paper on Energy Policy, published in 1998, and links energy sector development with national socio-economic development plans. In addition, it provides practical guidelines for the

The National target for reduction in energy demand is 12% by 2015

[3] Engineering News Online, 5th Jan 2009 http://www.engineeringnews.co.za/

4 The target stated above is expressed as a percentage reduction against the projected national energy usage in 2015.

implementation of efficient practices within the economy.

The vision of the Strategy is to contribute towards affordable energy for all, and to minimize the effects of energy usage upon human health and the environment by encouraging sustainable energy development and energy use through efficient practices.

The Strategy sets a national target for energy efficiency improvement of 12% by 2014. This target is expressed in relation to the forecast national energy demand at that time, and therefore allows for current expectations of economic growth. It is accepted that this target will be challenging, but at the same time it is considered to be readily achievable.

Implications for UCT

Energy efficiency improvements are to be achieved largely via enabling instruments and interventions. These include inter alia economic and legislative means, efficiency labels and performance standards, energy management activities and energy audits, as well as the promotion of efficient practices. The new national standard for energy efficiency SANS 204 (described below) is one of the first outcomes of this strategy. Although SANS 204 will at first be voluntary, it will become mandatory, as soon as is practical, (expected in 2009). SANS 204-1 dealing with general requirements will eventually form part of the National Building Regulations. Parts 2 and 3, which deal with naturally ventilated buildings and artificially ventilated buildings, respectively, will eventually become part of the SANS 10400 National Building Code.

National Framework for Sustainable Development (NFSD) 2008

The purpose of this framework is to pronounce South Africa's national vision for sustainable development and indicate its intended interventions to re-orientate South Africa's development path towards sustainability. It does not present detailed strategies or actions, but rather proposes national vision, principles, trends, strategic priority areas and a set of implementation measures that will enable and guide the development of the national strategy and action plan.

The NFSD presents a set of principles that includes, amongst others, social equity, efficient and sustainable utilisation of natural resources, and consultation and participation. Priority areas for action are identified as: enhancing systems for integrated planning and implementation; sustaining our ecosystems and using resources sustainably; investing in sustainable economic development and infrastructure; creating sustainable human settlements; responding appropriately to emerging human development, economic and environmental challenges.

Draft National legislation

- National Environmental Management: Waste Management Bill 2007
- Renewable Energy Feed-in Tariff and Incentives Bill 2008

National Environmental Management: Waste Management Bill 2007

This Bill aims to reform the law regulating waste management in order to protect human health and the environment, by providing measures for the prevention of pollution and ecological degradation, national norms and standards for regulating the management of waste by all spheres of government, and for specific waste measures such as the importation of waste. It contains a requirement for the establishment of a National Waste Management Strategy.

The Bill acknowledges that the minimisation of pollution through vigorous control, cleaner technologies, cleaner production and consumption practices and waste minimisation is the key to ensuring that the environment is protected from the impacts of waste. In addition, it recognizes waste as a resource that offers certain economic opportunities.

In terms of the Act, every municipality must conduct municipal waste management activities in accordance with the National Waste Management Strategy and ensure that waste management services are provided in a manner that prioritizes the recovery, re-use and recycling of wastes and provides for the treatment and safe disposal of waste as a "last resort".

Government aims to reduce the amount of "big five" wastes – plastics, cans, paper, glass and tyres – that reach landfills, by 70% by 2022, and has plans for minimising and treating the remaining 30%. National initiatives embarked on to realise the goal of zero waste include agreements signed by government and members of priority waste-stream sectors such as the manufacturers of plastic bags and the waste-glass industry, and a MoU with the waste-tyre sector.

The Waste Management Bill is currently being discussed in Parliament and is expected to be enacted in 2009.

Implications for UCT

UCT's own Waste Management plans should be aligned with the principles in the Bill, as well as government targets for waste reduction and recycling. Prioritizing the recovery, re-use and recycling of wastes and providing for the treatment and safe disposal of waste as a last resort.

Renewable Energy Feed-in Tariff and Incentives Bill (REFITI) 2008

The Department of Minerals and Energy released the White Paper on Energy Policy in 1998, and the White Paper on Renewable Energy in 2003. Both policy documents profile renewable energies and provide for a diversity of energy sources in the production of electricity. Further legislation relating to electricity includes the National Electricity Regulation Act to establish the National Energy Regulator of South Africa; the Electricity Regulation Act[5], No 4 of 2006 to regulate the electricity industry and mandate the Regulator; and most recently the National Energy Act 34 of 2008.

[5] Over the last year, a number of regulations flowing from the Electricity Regulation Act have been drafted, together with numerous policies, including the Electricity Pricing Policy, which has been recently approved, and addresses in greater detail, the policy positions on electricity pricing.

The proposed Renewable Energy Feed In Tariff and Incentives (REFITI) Bill seeks to provide feed- in tariffs for renewable energy sources in the national grid and also provide for necessary incentives, since renewable energy sources are inherently more expensive than conventional fuel sources.

The National Energy Regulator of South Africa (NERSA) hopes to finally approve the long-awaited renewable energy feed-in tariff, aimed at stimulating investment in the sector, on March 9 2009[6].

Implications for UCT

This Bill may provide incentives for the development of renewable energy sources on UCT campuses. Owing to the more expensive cost of generating electricity from renewable energy sources such as wind, sun and natural gas, feed-in tariffs are seen as a structure to stimulate large-scale investment in the renewable energy sector. The REFITI Bill would not lower the cost of electricity for the customer, but would subsidise renewable energy generators. The tariff is expected to cover the cost of generation, plus a fair return for investors. The model calculates the subsidy amount as the difference between the feed-in tariff provided, and the avoided cost of power generation.

The financial implications of this Bill require further investigation.

Provincial Policy

- Sustainable Development Implementation Plan (SDIP) 2006
- Western Cape Sustainable Energy Strategy and Programme of Action March 2008
- A Climate Change Strategy and Action Plan for the Western Cape March 2008

The Western Cape Sustainable Development Implementation Plan (SDIP) 2007

The aim of the SDIP is to provide an action plan to ensure that the principles of sustainable development are effectively embedded in the policies, strategies, programmes and projects of the Western Cape Government. The vision of the SDIP is closely aligned to the broader strategic framework of the National government, as defined by the Constitution, the National Framework for Sustainable Development and other key documents. It further takes the strategic framework for the Western Cape Province, as defined by the Provincial Growth and Development Strategy (PGDS) as its point of departure. Sustainability is at the heart of the Western Cape's programme for action, and the SDIP's purpose is to help implement the PGDS with a focus on sustainability. The SDIP lists a number of sustainable development principles that should guide the development and implementation of policy and strategy within the Western Cape.

The vision for the SDIP is as follows:

> *For the Western Cape Province, sustainable development will be achieved through implementing integrated governance systems that promote economic growth in a manner*

[6] Engineering News Online, 5th Jan 2009 http://www.engineeringnews.co.za/

that contributes to greater social equity and that maintains the ongoing capacity of the natural environment to provide the ecological goods and services upon which socio-economic development depends.

A Climate Change Strategy and Action Plan for the Western Cape 2007- DEA&DP

A comprehensive document has been produced for the provincial department of Environment, DEA&DP, with significant contribution from the UCT climate research group CSAG. First section examines climate change and socio-economic factors in the Western Cape, and establishes the need for a climate change response in the region. The second section outlines the broader aspects of the Western Cape's climate response strategy.

Towards establishing the need for a climate change response, a number of stress factors with likely results are identified through the application of a range of climate models:

- An increase in the annual average temperature of at least 1 °C by 2050
- Possible increase in the frequency and intensity of extreme events
- An increase in conditions conducive to wildfires (higher temperatures and increased wind velocity)
- Reduced rainfall in the western parts of the Western Cape
- Decreased water resources
- Reduced soil moisture from an increase in temperature coupled with a decrease in average precipitation
- Temperature impacts on crop activities – crop burn, drought, pests and microbes resulting in yield reductions, and loss of rural livelihoods.

The Strategy outlines two key ways to respond to a changing climate. One is through mitigation; the other, equally important response is adaptation, which is the process of recognising the effects of climate change and adapting to these changed conditions. Adaptation implies behavioural change in response to the changed conditions, such as the implementation of alternative farming practices, appropriate measures in development planning, and changes in demand side management practices[7]. This implies behavioural change by the consumer rather than the supplier. While mitigation efforts are not going to be effective in the short term (10 – 30 years), progress must be made in developing technologies and approaches to reducing carbon emissions.

The development of the Western Cape response strategy and action plan involved the application of a vulnerability framework to identify priorities in dealing with climate change. The following systems and sectors – natural and human – are identified as priorities and these reflect considerations of climate vulnerability, the significance of the systems and sectors at risk and the required need for government intervention to encourage a timely and efficient response.

- Natural systems – water, biodiversity, and coastal and marine systems and resources

[7] Demand-side management is the practice of controlling the use of resources such as water, and of utilities such as electricity by controlling the demand for these resources.

- Economic sectors – agriculture, tourism and fisheries
- Economic resources and infrastructure – energy, transport, health and air quality
- The built environment, livelihoods and disasters – social systems, extreme events (floods, fires).

The Western Cape's Climate Change Action Plan is based on a set of integrated cross-sectoral planning and implementation programmes. These programmes include both mitigation and adaptation responses:

1 Adaptation response strategy and programmes

- Integrated Water Management Programme - a cohesive Water Supply and Infrastructure Management Programme that integrates climate impacts and risks
- Climate change, weather research and information programme
- Land stewardship and Livelihoods Programme

2 Mitigation response strategy and programmes

- Energy, transport, waste and air quality management programme

In the Western Cape Climate Change Strategy and Action Plan, less than 15% of the total budget for the Western Cape government is allocated to mitigation. The remaining 85% goes towards adaptation measures: increasing capacity, strengthening resilience and minimising risk. This prioritisation of adaption measures may have relevance for UCT's own strategy for dealing with climate change.

Waste Management is identified as a means of reducing the carbon footprint. Integrated waste management solutions require prioritisation of a consideration of waste classification and related disposal costs. The higher calorific value waste matter, if of significant volumes, can be effectively disposed of through conversion to an energy stream, whereas landfill options and recycling should be considered for lower value waste streams. Technology development, capacity building and job creation opportunities exist in all of these options.

It is argued that integrated waste management strategies can create jobs, minimise environmental and health impacts of poor waste management and at the same time, allow the province to harness energy (methane capture) thus providing a mitigating response to climate change at the same time as enhancing provincial energy security with a localised, decentralised energy supply[8].

Implications for UCT

There are far-reaching implications for UCT, with regard to both adaption and mitigation, for UCT's polices on energy and water conservation, biodiversity, transport, waste and air quality management. Extreme events may have implications for disaster management on campus and for fire management plans. Adaptation measures would include minimising risk factors such as invasive aliens and creation of fire breaks.

[8] DEA&DP 2007

Western Cape Sustainable Energy Strategy and Programme of Action 2008

The Sustainable Energy Strategy and Programme of Action was developed to support and complement commitments contained in the Provincial Growth and Development Strategy (PGDS) and the Sustainable Development Implementation Plan (SDIP), as well as contributing to the achievement of the Millennium Development Goals and the Johannesburg Plan of Implementation. This will all be supported through a future institutional structure. The Sustainable Energy Strategy and Programme seeks to:

- support economic and social development, poverty alleviation and infrastructure development;
- address environmental issues such as air quality, energy conservation and climate change;
- foster the development of a clean energy sector; and
- support and enhance provincial investment programmes in an effective manner.

The aim of the programme is to achieve, by 2020, a generation system that recognises a greater portion of energy from renewable sources (15% by 2014) and which is characterised by:

- extensive renewable energy generation across the Province by Independent Power Producers from sources such as wind, wave, biomass, solar, small hydro
- a focus on developing decentralised energy generation systems and micro-generation
- combined heat and power systems operating in a greater number of businesses, homes and industries
- fuel cells and clean propulsion systems dominant in transport, heat and power and which complement renewable energy production
- natural gas and cleaner fuel sources which are to replace coal in the development of power generation projects

A further target is for new buildings over a certain size to include on- site generation for 10% of their energy needs, with a proposed inception date of 2009.

Implications for UCT

Legislation is anticipated as an outcome of this provincial policy, with which UCT will need to comply. This strategy and programme of action will be presented to the Provincial Cabinet as a Green Paper. It will then be developed into a White Paper and some elements of the White Paper will be taken up in provincial legislation. This proposed Green Paper is seen as the first formal step towards a Western Cape Energy Act.

In order to stimulate the market for Renewable energy technologies, the Strategy proposes investigating the development of a province-wide carbon tax in line with the national environmental fiscal reform processes. Carbon reduction strategies need to be prioritised to avoid these taxes, should they be implemented in future.

In responding to this provincial strategy, UCT would focus on developing on-site energy generation, combined heat and power systems and clean propulsion systems for transport.

Table 1: Proposed Energy Targets for the Western Cape

ACTION	TARGET	DATE
1. Renewable energy generation (electricity only) in the Western Cape off the current consumption baseline of 4200MW	15%	by 2014
2. Overall energy efficiency against business as usual scenario	15%	by 2014
• Industry energy efficiency	20%	by 2014
• Residential energy efficiency	10%	by 2014
• Commercial energy efficiency	11%	by 2014
• Transport energy efficiency	12%	by 2014
• Government	12%	by 2014
3. Overall energy efficiency against business as usual scenario	15%	by 2020
4. Carbon dioxide emissions reduction (in 2000 levels)	14%	by 2014
5. Carbon dioxide emissions reduction (in 2000 levels)	15%	by 2020
6. Renewable Energy purchased by Provincial Government	10%	by 2010

Source: DEA&DP. Sustainable Energy Strategy and Programme of Action for the Western Cape, 2008

Local Authority

- Air Quality Management Plan 2005
- City of Cape Town Energy and Climate Change Strategy 2006

Air Quality Management Plan 2005

The City of Cape Town has introduced an Air Quality Management Plan as required by the NEMA: Air Quality Act, 2004, and this endorsed in August 2005.

During 2003, the air quality monitoring stations recorded 162 days of poor air quality when the levels exceeded international accepted guidelines. These episodes and levels of air pollution represent a major health risk to citizens and visitors. Local emissions that have local health and visual impacts include nitrogen and sulphur oxides, volatile organic compounds and particulate matter. Due to the significant role petrol and diesel play in Cape Town's energy-use profile, these energy sources are responsible for much of the local pollutants in the atmosphere. Estimates are that diesel contributes about 40% to the 'Brown Haze' phenomenon, and petrol 25%.

The key objectives of the Air Quality Management Plan are, amongst others, to specify ambient air quality standards and targets for Cape Town; monitor priority pollutants which cause 'Brown Haze' and affect human health; enforce current and future legislation for air quality management; compile a comprehensive emissions inventory database for the City; and control vehicle emissions in the City.

There are currently 14 permanent air quality-monitoring stations across the metropole that monitor air quality. City Health Department of the City of Cape Town also enforce the City of Cape Town Environmental Health By-law 2003 and Air Pollution Control By-law, February 2003. The City of Cape Town is reviewing its current air pollution by-laws to make them stricter and more effective.

Relevance to UCT

The Plan identifies the need for the environmental health sector, of which the air quality section is part, to form partnerships with the public and private sectors and to work across sectors such as environment, housing, transport, energy, water, waste. Intersectoral efforts are considered important in order to address complex, inter-related, cross-cutting problems whose determinants or solutions lie outside the direct control of the health sector. As a leading institution in the City of Cape Town, focused contributions to the air quality issues of this city should be a priority at UCT, in terms of research and operations, waste management and emissions.

City of Cape Town Energy and Climate Change Strategy 2006

The Energy and Climate Change Strategy has been compiled as part of the City of Cape Town's Integrated Metropolitan Environmental Policy (IMEP) framework which forms the foundation for environmental management. The Energy and Climate Change Strategy includes an array of short and long-term implementation measures. The Strategy is one of Cape Town's contributions to the Johannesburg Plan of Implementation and to the commitments made by the City about renewable energy and solar water heaters at the international Bonn Renewables Conference 2004, as well as support for other international efforts including the Kyoto Protocol.

The Energy and Climate Change Strategy includes various quantifiable targets for Cape Town:

Energy supply sector:

- Quantity of CO2 emissions reduced by 10% from 2005 levels by 2010
- Energy Supply Target: 10% of energy to come from renewable sources by 2020.

Commercial and Industrial sector:

- Target: 10% increased energy efficiency in industrial and commercial facilities by 2010.

Transport sector:

- Bicycle and pedestrian transport use maximised
- Target: A fully operational 'Non-motorised Transport Strategy' by 2015.

Implementation approaches to achieve this objective include focus on improving quality of public transport to the city centre; developing 'park & ride' facilities around the city centre; Improve public transport within the city centre and exploring disincentives for private vehicles.

The targets committed to in the International Action Programme developed at the Bonn 2004 Renewable Energy Conference:

- 10% renewable energy supply by 2020, and
- 10% of households with solar water heaters by 2010.

Short-term targets will focus on achieving energy efficiency covering several sectors, notably industry, commerce, government and residential. Removing barriers to energy efficiency focuses on five areas: (1) enabling policies (such as this strategy), (2) sustainable finance (e.g. involving commercial banks), (3) evolving appropriate business models (e.g. ESCOs or dedicated units in the City); (4) information for all stakeholders; and (5) technology and technical capacity.

Best Practice

Green Star SA – Office Pilot Rating Tool 2008

The Green Building Council of South Africa developed Green Star SA, based on the Green Building Council of Australia's Green Star rating system, to provide the commercial property industry with an objective measurement for green buildings and to recognise and reward environmental leadership in the property industry. Each Green Star SA rating tool reflects a different market sector or phase in the building life cycle, the first being for the office sector. Further tools for other building types will be developed in future e.g. Retail, Schools.

Green Star SA covers a number of categories that assess the environmental impact of a project's site selection, design and construction. These nine categories for which credits are obtained include Management, Indoor Environment Quality, Energy, Transport, Water, Materials, Land Use & Ecology, and Emissions with a special category for Innovation.

The following Green Star SA certified ratings are available for all projects:

- Four Star Green Star SA Certified Rating recognises - "Best Practice"
- Five Star Green Star SA Certified Rating recognises - "South African Excellence"
- Six Star Green Star SA Certified Rating recognises - "World Leadership"

While practitioners are invited to use the Green Star SA rating tools as design and benchmarking aids, a design, project or building cannot publicly claim a Green Star SA rating unless the GBCSA has certified the rating. The GBCSA will commission one or more third-party certified Assessors to validate the project's self-rating and recommend a Green Star SA Certified Rating. A fee is paid to the GBCSA for assessment, calculated on a sliding scale according to the floor area of the building.

Relevance to UCT

It is recommended that UCT adopt a four Star standard for all new projects and major refurbishments. An accredited Green Star professional should be included in the project team for each building project. The cost of assessment is quite substantial and will need to be budgeted for e.g. a 10 000m² building costs R60 000 to assess for Green Star certification for members and R73 000 for non-members. It is also recommended that some staff of Properties and Services become Green Star accredited professionals. The GBCSA offers training courses and an on-line exam is offered centres around the country.

South African National Standard SANS 204 Energy Efficiency in buildings 2008

Following the publication by the DME of their strategy for energy efficiency in 2004, the need arose for a national standard to achieve this goal in the building sector. The first three parts of SANS 204 were published in 2008 and are due to come into effect in 2009.

Although SANS 204 will at first be voluntary, the DME and DTI will make it mandatory, as soon as is practical (this is expected in 2009). While intended for mandatory application in new buildings, SANS 204 can also be used for voluntary energy efficient retrofits of existing buildings, as the owners strive to reduce their electricity and energy accounts. Each part of SANS 204 covers a different aspect.

- SANS 204-1:2008 Energy efficiency in buildings Part 1: General requirements
- SANS 204-2:2008 Energy efficiency in buildings Part 2: The application of the general requirements of energy efficiency in buildings with natural environmental control
- SANS 204-3:2008 Energy efficiency in buildings Part 3: The application of the general requirements of energy efficiency in buildings with artificial environmental control

SANS 204-1 gives the general requirements for energy efficiency. According to the approach used in the revised South African Building Regulations and the new building code (SANS 10400 series), which should be published early in 2009, performance parameters are outlined first. These are followed by the route to demonstrate compliance, either by 'rational design' or 'deemed-to-satisfy' rules. This first part sets out the general requirements for achieving energy efficiency in all types of buildings as performance parameters, and will eventually form part of the National Building Regulations. Parts 2 and 3, which deal with naturally ventilated buildings and artificially ventilated buildings, respectively, will eventually become part of the SANS 10400 National Building Code. SANS 204-1 has generic guidelines for energy efficiency in buildings and contains two key tables:

- Table 3: Maximum energy demand per building classification for each climatic zone
- Table 4: Maximum annual consumption per building classification for each climatic zone (kWhr/m2/annum).

For example, the maximum annual consumption for 'Places of Instruction' in Cape Town provided in Table 4 of SANS204-1 is 390 kWhr/m2/annum, whereas for Offices it is 185 kWhr/m2/annum.

The deemed-to-satisfy rules take a holistic approach in the design of buildings. The interventions include correct orientation, shading, insulation, and window design, rules for lighting, hot water cylinders, air-conditioning systems, and lifts.

The use of renewable energies is encouraged by the standards. In particular, the installation of solar water heaters is required unless it can be proven that they are not feasible. SANS 204-3 states that "*... All new buildings shall be fitted with solar water heating systems complying with SANS 1307, unless it is not technically feasible*. "

Relevance to UCT

This standard is likely to have a major influence on building design, with respect to passive design (design for climate), thermal performance of the envelope, and building systems (air-conditioning, lifts). The targets are likely to prove challenging initially for the professional team; however this

should be overcome within a few years as the design professionals adopt more energy efficient design as standard practice. There are also likely to be additional capital costs; however these would be recouped over period of years through operational savings.

The use of solar water heating should become standard practice, in particular for the Residences. Other Renewable energy technologies that can reduce electricity consumption will need to be integrated into project designs.

APPENDIX E

CASE STUDY: HARVARD GREEN CAMPUS INITIATIVE

Source: http://www.greencampus.harvard.edu/

Background

The Harvard Green Campus Initiative began in the year 2000 with a one year grant from the Office of the Provost. This grant was used to employ Harvard's first full time campus sustainability professional, Leith Sharp, with a dual academic and administrative role.

From March 2000 to June 2001, Leith Sharp worked with colleagues Tom Vautin and Jack Spengler to create a well-supported strategic plan for Harvard University to green the campus, to build internal support building and define the vision. In late 2001, after 15 months of work, they requested five years of funding at $150,000 a year, to further establish the Harvard Green Campus Initiative along with the establishment of a $3 million Green Campus Loan Fund.

With this new financial support in place, Leith was able to focus all energies on building an organization capable of providing green campus programs and services to multiple schools and Departments across Harvard University. By preserving the Director's function as program development (figuring out funding, project definition, staff training and management) rather than project management (staffing the actual project implementation itself), they were able to create a wide reaching green campus effort.

During 2001-2002, the Director worked to establish a range of new programs serving various Schools and Departments. Over time, the case was successfully made for the Schools and Departments to directly fund the HGCI to provide green campus services.

Harvard adopted a set of campus-wide sustainability principles in 2004 and has since translated these principles into a set of comprehensive sustainability guidelines for the development of the campus. Refer to the box below for these Principles.

The Harvard Office for Sustainability was established in 2008, and reports to Executive Vice President. It provides vision and oversight for implementation of the greenhouse gas reduction goal; helps realize other sustainability goals for the University e.g. changing behaviour and improving efficiency measures in buildings, as well as better procurement practices and improved waste reduction. Under the guidance of the unit and with support from the Schools, Harvard has instituted a variety of projects and programs: converting shuttle buses to biodiesel, renewable energy projects, instituting organic landscaping, providing growing technical support for waste reduction, and continuing to implement environmental education programs.

Harvard University
Statement of Sustainability Principles

Harvard University is committed to developing and maintaining an environment that enhances human health and fosters a transition toward sustainability. Sustainability should be advanced through research, analysis, and experience gained over time. To that end, Harvard University is committed to continuous improvement in:

• **Demonstrating institutional practices that promote sustainability,** including measures to increase efficiency and use of renewable resources, and to decrease production of waste and hazardous materials, both in Harvard's own operations and in those of its suppliers.

• **Promoting health, productivity and safety** of the University community through design and maintenance of the built environment.

• **Enhancing the health of campus ecosystems** and increasing the diversity of native species.

• **Developing planning tools** to enable comparative analysis of sustainability implications and to support long-term economic, environmental and socially responsible decision-making.

• **Encouraging environmental inquiry** and institutional learning throughout the University community.

• **Establishing indicators for sustainability** that will enable monitoring reporting and continuous improvement.

The principles are the result of a process commissioned by President Lawrence H. Summer after hearing concerns from students, alumni, and members of the community regarding the development of a sustainable future campus.
Harvard University Gazette, October 14, 2004

The Harvard Office for Sustainability (OFS) team works across a population of over 40,000 individuals in 600 buildings to ensure continuous improvement in campus design and operations in support of campus sustainability. With the support of leadership and staff throughout the departments, the Office for Sustainability has grown from a small office with a lone director to a central unit consisting of 20 professionals who work to educate the community about environmentally friendly practices and to support projects aimed at implementing those practices across a range of departments and disciplines.

There is a particular focus on reducing Harvard University's greenhouse gas emissions which, like most large research universities, have been increasing at a steady rate of around 4% per year since 1990. In the last 2 years a number of schools at Harvard University have finally started to reverse this upward trend and are now reducing their emissions each year. Over the years the HGCI established a full range of programs, services, incentives and courses.

Summary of Programmes

- Best Practices Exchange – HGCI hosts forums for bringing university professionals together to learn about best practice in achieving campus environmental impact reductions.
- Clean and Renewable Energy - research
- Faculty of Arts - Campus Energy Reduction Program
- Faculty of Arts - Resource Efficiency Program
- Green Campus Loan Fund
- Green House Gas Inventory
- Green Campus Building Service
- Longwood (Medical) Green Campus Initiative
- Recycling at Harvard
- Sustainability Course – A community- wide Extension School course is made available to both classroom and distance learners, graduate, and undergraduate students
- Graduate Green Living Program - residences

A detailed description of each programme is available on the website: www.greencampus.harvard.edu/

Activities Underway

The activities currently underway across Harvard schools and departments in partnership with the OFS include:

- As of June 2007 Harvard had 20 LEED registered building projects both new construction and renovation projects. Many green building projects have achieved energy performances of 30-50% above code and construction waste recycling rates of over 90%.

- Graduate Green Living programs implemented to outreach to over 9,000 undergraduate and graduate residential students. As a result recycling rates have increased by over 40% and energy use has been reduced by 10-15%.
- Resource Efficiency Program:
    - Addressing energy conservation in existing buildings with the Green Campus Loan Fund.
    - Purchasing renewable energy certificates to offset 7% of Harvard's electricity consumption while investing another $100,000 a year into renewable energy research and internal business development for an expanded renewable energy portfolio.
    - Building energy audits to identify and implement building upgrades. Recent building energy upgrades have achieved energy use reductions of 30%.
    - Staff training to build capacities for high performance building operations.
- Research support to identify, trial and implement new practices including:
    - Campus wide green-cleaning service
    - Biodiesel is now used in all Harvard owned buses
    - Trial of kitchen oil to make biodiesel and/or use directly to fuel recycling truck
    - New air quality controls being trialled on construction machinery
    - A large-scale indoor environmental quality and productivity study is underway to determine building design impacts on productivity at Harvard University.
- Waste Management and Recycling Service is achieving a 45% recycling rate
- Commuter Choice Program subsidizes public transport and improves bicycle facilities
- Ongoing expansion of local and organic produce in Harvard University Dining Service.

Funding of the Harvard Green Campus Initiative

Currently the Office for Sustainability receives 20% of its funding from the Harvard University's central funding. The remaining funding is generated via fee for service partnerships that OFS negotiates annually with a variety of Harvard University departments. Through these partnerships, many departments access expertise to generate cost effective green campus projects including building operations, building design, procurement, behavioural change and energy conservation projects. All partnership agreements

emphasize the generation of project savings to rationalize the investment in fee for service OFS project support.

The University has also established a $12 million revolving, interest-free loan fund – the Green Campus Loan Fund - to support projects at the Schools that reduce the consumption of energy and other resources. This fund, the only one of its kind and magnitude at a university, has provided assistance to more than 150 conservation projects, achieving significant environmental and financial benefits.

The Green Campus Loan Fund provides capital for high performance campus design, operations, and maintenance and occupant behaviour projects. Basic project eligibility guidelines state that projects must reduce the University's environmental impacts such as greenhouse gas reductions, energy conservation, and water conservation. The loan supports both existing building reconstruction and new construction efforts including renewable energy projects.

The Harvard Green Campus Initiative has consistently generated savings far in excess of the cost of running the initiative.