

UNIVERSITY OF KWAZULU-NATAL

Creating a ‘Green University’

by

Nisha Singh

7407399

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Supervisor: **Professor Anesh Maniraj Singh**

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DECLARATION

I, **Nisha Singh** declare that:

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Abstract

Evaluating the environmental performance of a university is important in order to identify more sustainable options for reducing the environmental footprints. The study was conducted at the University of KwaZulu-Natal (UKZN). The aim of the study was to assess the current greening status at UKZN, and then evaluate staff support to facilitate greening. The objectives of this study were to determine the current greening initiatives by staff and the university, staff support for greening and whether there were demographic differences in attitudes towards greening. The questionnaire was designed to obtain demographic information about the respondents, whether or not they contributed to greening, the nature of their contributions, reasons for apathy and suggestions to facilitate greening. Staff were also asked about current and possible future modes of transportation to the workplace, and about extending the computer replacement period. Seeing as no previous greening studies were conducted at UKZN, it was decided to obtain information from as many staff members as possible, through a web-based survey using the on-line software programme QuestionPro.

Greening was considered to be important by the majority (97%) of the survey respondents, but only 67% of them actually contributed towards greening UKZN. In this respect, switching off lights was most practised (14.7%), followed by switching off computers after work (12.9%) and writing notes of scrap pieces on paper (12.3%). Other greening practices in order of popularity included the collection of used paper for re-cycling, the reporting of leaking taps, printing on both sides of the paper, and returning printer cartridges. Least selected greening practises were printing of the final copy only, indigenous gardening and animal care. There were numerous suggestions which covered mechanisms to save electricity, paper, and water, to facilitate greening at UKZN. The pursuit of management support and an established strategic environmental plan to steer and guide greening at UKZN, was considered urgent. The importance of awareness campaigns, better communication and facilitated recycling were emphasized. The vast majority of the staff (79.2%) travelled to work by means of their own transportation. Sharing of transport occurred in 11.6% of the sample. Public transportation, walking and cycling were used less frequently. Overall, the staff regarded intensified re-cycling, awareness and teaching programmes and the election of a dedicated team to manage greening projects as priority.

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CHAPTER 1

Introduction

1.1 Introduction

In a time faced with increasing environmental challenges, the tertiary education sector is being recognised as well suited to take on the leadership for environmental protection. At the turn of the twenty first century, the overall environmental quality of universities was assessed as relatively poor, particularly concerning recycling (Dahle and Neumayer, 2001). Budgetary constraints, a lack of knowledge about greening technologies, as well as an institutional reluctance to change, were reasons given. However, in recent times some universities have begun to make major advances in shrinking their carbon footprints and improving efficiency. Renewable biomass such as locally sourced wood chips has been used to power a heating plant at Green Mountain College in Poultney, Vermont, (Mascarelli, 2009). The University of Minnesota, has constructed a large-scale wind-research turbine that supplies power to most of its buildings. Harvard University has more than sixty green building projects in progress. One of its building renovations resulted in a 35% improvement in energy efficiency and a 40% reduction in water use (Mascarelli, 2009). The motivation for this study, the focus areas, the problem statement, research questions and objectives are described in this chapter.

1.2 Motivation for the study

The University of KwaZulu-Natal (UKZN) is comprised of the former Universities of Durban-Westville and Natal. The University of Natal had an environmental policy which was ratified in 1998. Recycling projects were wide-spread at the former University of Natal prior to the merger. Following the merger, greening projects and campaigns have become vague.

1.3 Focus of the study

The study investigates greening on all five campuses of UKZN, in a combined and random fashion, by means of an on-line survey accessible to all staff. Staff identity and locality remain anonymous. The results of the survey would reveal the greening status at UKZN,

following analysis of the data. The survey seeks to evaluate progress made to date, then deeply examine staff responses to learn about accelerating progress towards a commitment to campus environmental sustainability. In addition to recycling, the study also attempts to investigate staff transportation and electricity usage which are key sources of greenhouse gases. The study also examines computer usage by staff with the objective of finding mechanisms of reducing electronic (e-) waste.

1.4 Problem statement

Higher education institutions can be described as microcosms of environmental problems facing the larger society in numerous ways. At the turn of the twenty first century, the overall environmental quality of universities was assessed as relatively poor, particularly concerning recycling. Budgetary constraints, a lack of knowledge about greening technologies, as well as an institutional reluctance to change, were reasons given. In recent times some universities in the US and Europe have begun to make major advances in shrinking their carbon footprints and improving efficiency. However this may not be the case in South Africa. Therefore with regard to UKZN it would be important to assess the barriers to greening and determine how greening can be facilitated.

1.5 Research questions

- 1.5.1 How are staff currently contributing toward greening UKZN?
- 1.5.2 What can be done to facilitate greening at UKZN?
- 1.5.3 What do staff prioritize as greening projects?

1.6 Objectives

- 1.6.1 To determine the current greening projects at the UKZN
- 1.6.2 To determine whether staff would support greening
- 1.6.3 To determine whether there are demographic differences in attitudes towards greening

1.7 Summary

Evaluating the environmental performance of a university is not a trivial task due to the complexity and diversity of the operations. Nevertheless, it is deemed important to estimate these in order to identify more sustainable options for reducing the environmental footprints. Seeing as no previous greening studies were conducted at UKZN, it was decided to obtain information from as many staff members as possible, and the most convenient way was by means of a web-based survey using the on-line software programme QuestionPro. All UKZN staff members had access to the internet, therefore every staff member was given the opportunity to participate. Cleaning staff and other casual contractual workers who had no access to the internet, were excluded.

Regardless of whether a university is on the forefront of environmental stewardship or just beginning to carry out a few isolated changes to protect the environment, there are many opportunities for improvement. The process of greening the university requires careful and directed gathering of data that will eventually contribute to meaningful change. Following analysis of the data, recommendations to facilitate greening at UKZN will be made. The literature survey which provides an overview of the ‘greening’ topic follows in the next chapter.

CHAPTER 2

Literature Review

2.1 Introduction

A sustainable, eco-friendly or natural operation that conserves natural resources, eliminates waste, and minimizes harmful emissions is said to be 'green' (Vasishta, 2009). 'Green' has served as an umbrella for energy utilization, environmental management, and waste remediation, and focuses on the critical frontiers of economics, science and policy. Economics represents human choice. Science captures the knowledge and technology for implementation, and policy represents the boundaries established to constrain or encourage human choice (Jenner, 2008).

The issue of environmental protection and governance came to prominence in the 1960s when the adverse effects of industrial growth became pronounced. Climate change and depletion of the ozone layer have been widely believed to be the world's largest environmental problems. The discovery of the link between chlorofluorocarbons (CFCs) and ozone depletion was made in 1974. It had become clear that human action had significantly increased the production of these gases, and the process of 'global warming' was accelerating. In 1977, the UNEP (United Nations Environmental Programme) held an expert meeting to formulate a world plan of action for further study of the issues. From this arose the Montreal Protocol to phase out the production and consumption of ozone-depleting chemicals according to a time schedule, which was signed in 1987 (Anderson and Madhava, 2004).

Negotiations on factors that affect climate change gave rise to The Kyoto Protocol in December 1997, which committed the industrialized nations to specified, legally binding reductions in emissions of six greenhouse gases (UNFCCC, 2010). The Montreal Protocol has served largely to eliminate the production and use of ozone-depleting chemicals, while the Kyoto Protocol is focused toward stabilizing greenhouse gas emissions.

2.2 The Kyoto Protocol and the environment

Under The Kyoto Protocol, richer countries are expected to reduce emissions in aggregate by 5% of the 1990 level of greenhouse gas emissions. These targets expire in 2012. The developed world has accepted responsibility for greenhouse gas emissions, and is required by The Kyoto Protocol to provide financial aid for global projects aimed at reducing these emissions (UNFCCC, 2010). The economic recession of 2008/09 has slowed this trend and the concentration of carbon dioxide in the atmosphere is now at its highest for at least 800 000 years. The concentration of carbon dioxide in the atmosphere at 350 parts per million (ppm) is regarded as stable. However at present it is approximately 390 ppm, and regarded as dangerous (Rockström, 2010). Greenhouse gas emissions from both developed and developing countries have been increasing rapidly (Sukhdev et al., 2010).

In an attempt by the UN to forge agreement for the renewal or replacement of the Kyoto Protocol, arose the Copenhagen Accord in December 2009 which was drafted by China, India, Brazil, South Africa and US. The continuity of the Kyoto Protocol is unclear and the Accord makes no reference to quantified emissions targets, either in global aggregate or at national level. Nonetheless for the first time, a mechanism to record, at international level, the emission reduction actions by developing countries was established (UN, 2010). Given South Africa's natural abundance in coal and the demand for electricity, dirty energy (which produces CO₂ emissions) production has intensified. With additional coal based energy expected to reach 140 000MW by 2012, it is clear that South Africa will remain a large emitter well into the foreseeable future (Modise, 2010). This observation has strong implications for the country's emission reduction targets and its position in global climate negotiations. South Africa has therefore proposed to cut emissions by 25% before 2020 and by 42% before 2025 (Modise, 2010). Although ambitious, the reason for these targets is that strong and decisive action must be taken in order to avert future climate change (Modise, 2010). As humid forests act as sinks that absorb carbon dioxide, degradation of such forests equates to the release of these gases. As a result, the conservation of forests globally holds one key to slowing the pace and the effects of greenhouse gas emissions (Hough, 2010).

In addition to climate change and ozone depletion, seven other critical earth system processes including freshwater use, rate of biological diversity loss, ocean acidification, nitrogen and phosphorus inputs, air pollution from aerosols and chemical pollution, and land use change

have been identified (Rockström, 2010). In particular, water scarcity is expected to become a serious problem by 2030 due to climate change, declining water quality and increase in population. If there is no improvement in the efficiency of water use, the water supply is expected to fall 40% short of demand. Many supplies are becoming less reliable, therefore water is becoming scarce. In some cases, people will need to migrate to areas where water is more abundant. Considerable water policy reform will be necessary (Sukhdev et al., 2010). Therefore, focus cannot only be given to emissions reduction, instead an integrated approach to reducing environmental degradation is required (Rockström, 2010).

The UNESCO led Decade of Education for Sustainable Development (DESD), provides an institutional framework for change in educational institutions (UNESCO, 2010). This decade, which began in 2005, has almost reached its mid-term point, and although thousands of DESD-related actions have occurred throughout the world, it has not yet influenced, in a significant manner, educational programs worldwide (Ferrer-Balas et al., 2010). The higher education sector is not an exception, which is not surprising given its high resistance to change (Wals, 2009). There is a need for a 'systems approach' to involve universities, students, staff, alumni and society-at-large in making the transition to sustainable societies (Ferrer-Balas et al., 2010).

In Japan however, former Prime Minister Yukio Hatoyama set the country firmly on a green course with his proposal to reduce greenhouse gas emissions by 25% of the 1990 level by 2020. A mandatory scheme by the Tokyo Metropolitan Government to reduce carbon dioxide emissions from large office buildings and factories was then launched. Japan's business world followed suit with The Sony Corporation announcing its 'Road to Zero' global environmental plan, with the long-term goal of achieving a zero carbon-emissions by 2050. Doshisha Business School at Doshisha University in Kyoto, followed the path to green and introduced a two-year Green MBA in 2009 which is taught in English. This represented a move toward academic social responsibility. With the shift in focus around the globe towards environmental protection and conservation of resources, education has also started to move toward sustainability. What's more, consumers are now demanding more from companies in terms of sustainability and to address this demand companies in Japan and elsewhere in the world are looking to hire experts in the sustainability field. There is voluminous information available about sustainable technologies and practices available in Japanese which never reaches green audiences around the world. The Green MBA helps to address this. By

studying sustainable management, access to the latest information is achieved which can then be communicated to the world (Topmba, 2010).

2.3 Environmental protection

Climate change has moved from an issue of environmental concern to an issue of commercial significance in the period of a few decades. President Jacob Zuma announced a national emission reduction target in December 2009. This means that in the long term the economy will be transformed by shifting from an energy-intensive to a climate-friendly path as part of a pro-growth, pro-development and pro-jobs strategy (McNamara, 2010). Positioned globally, South Africa's economy is currently poorly placed to address a number of these concerns, given our strong dependence on fossil fuels. South Africa's climate competitiveness (compliance with international environmental climate change protocols) although improving, remains amongst the lowest of the G20 group of nations (McNamara, 2010). As a result of these concerns, business is required to play an instrumental role in developing and implementing climate policy, in a manner that goes beyond a process of engagement. Given the global nature of the climate challenge, a concerted business drive in collaboration with government is required. Hence, climate change should be viewed not just as a regulatory issue, but as a commercial issue shaping pricing, market equilibriums and the competitiveness of industries.

In South Africa, the National Environmental Management Act No. 107 of 1998 provides the legal framework for co-operative, environmental governance by establishing principles for decision-making on matters affecting the environment, including institutions that will promote co-operative governance and procedures (RSA, 1998a). In particular the National Waste Management Strategy focuses on the implementation of selected components including health care waste, recycling and waste information systems. The implementation will primarily take place through pilot projects. The overall objective is to reduce the generation and environmental impact of all forms of waste, so that the socio-economic development of South Africa, the health of its people, and the quality of its environmental resources are no longer adversely affected by uncontrolled and uncoordinated waste management (RSA, 2010a).

Many of the actions that reduce the environmental footprint of a university involve the reduction of waste, i.e., heat, water, electricity, chemicals and solid waste. Thus actions to reduce these wastes represent opportunities to save as well as to increase environmental sustainability. The green university of the future may use resources efficiently, creates little or no waste, and takes full responsibility for any waste that it generates. According to Creighton (1999), greening a university requires sound research, attention to details and unfailing commitment. It was also reported that university staff in purchasing, facilities, catering, printing, computer services and other departments hold the key to implementing many greening projects. In order to maximize output, careful targeting of those staff resources is required. It was stressed that environmental efforts should complement rather than consume the educational mission of the university (Creighton, 1999).

2.4 Why change is necessary – the rise of ‘Green Office Week’

The need to create environmental awareness in the work situation gave rise to the ‘Green Office Week’ campaign in the UK, and is now practiced in South Africa. One of its aims was to provide information about the worsening environmental situation. In this regard one of the pamphlets informs that nearly 80% of the world’s original old forests have been lost, 40% of which to making paper. Furthermore, the pulp and paper industry is the fifth largest industrial consumer of energy. Producing recycled paper on the other hand uses up to 70% less energy than virgin paper (Avery, 2010a).

The ‘Green Office Week’ campaign further informs as follows:

- Business discards 5 million tonnes of paper every year and most of this ends up in landfill.
- The average office worker uses 20 000 sheets of paper and generates 1 tonne of waste annually.
- At least half of all office waste is considered to be high grade such as expensive, non-recycled paper and cardboard.
- Seventy percent of office waste is recyclable but only 8% ever make it as far as a recycling bin.
- Office buildings consume large amounts of electricity and are responsible for over 40% of the world’s total primary energy consumption. Equipment such as lighting, air-conditioners, computers printers and photocopiers are often left on continuously.

- Landfill sites in the United Kingdom are due to run out during the next decade. To discourage the use of landfills, the price of landfill tax for companies will rise from £8 per tonne per year to £72 per tonne in 2013.
- Many office buildings are built from materials that originate from non-renewable sources.
- For every tonne of recycled paper purchased (instead of virgin paper) approximately 30 000 litres of water and 3 000 to 4 000 kWh electricity is saved (enough to power a 3-bedroom house for a year) (Avery, 2010b)

Office workers are thus made better aware of the value of greening and thereby participate more in greening projects. Similar campaigns at university may also result in more participative greening behavior in university workers.

2.5 Greening and universities

Even for companies that haven't made a public commitment to corporate social responsibility (CSR), many are taking steps to become greener. Since the early 1990s, higher education (HE) institutions have realised that they cannot teach about environmental values if they themselves are not authentic about embracing those values. The 'Talloires Declaration' emerged from a meeting of university presidents in Talloires, France in 1990, as a commitment to environmental education, leadership and research. The Talloires Declaration is a ten-point action plan for incorporating sustainability and environmental literacy in teaching, research, operations and outreach at colleges and universities (ULSF, 2010: p1). The University of KwaZulu-Natal is a signatory to this declaration and one of its goals is to 'Conserve the physical environment, and foster a culture of responsible, ethical and sustainable use of natural resources'. Furthermore the 1998 environmental policy of the former University of Natal (UKZN, 2010a) comprised of 14 principles that served as a strategic guide for an environmental/greening commitment through teaching, research and conduct, for protection and conservation of the indigenous fauna and flora, controlled utilisation of natural resources, waste management and pollution control, amongst other items, is currently under review toward the formulation of an environmental management plan.

In South Africa there are 23 public higher education (HE) institutions, with a student and permanent staff population of approximately 850 000 (RSA, 2010b). With regard to waste generation and consumption of energy and materials, universities are therefore comparable to large commercial concerns. There are 13 000 HE institutions worldwide which have considerable impacts on the environment (Lukman et al., 2009). HE institutions generate environmental impacts through both direct and indirect activities—the former include the use of classrooms, laboratories, offices and catering and the latter include commuting and consumption of food and drink at work by students and employees. The most significant environmental impacts from the operation of the university are global warming, acidification, human toxicity and terrestrial eco-toxicity, caused by heating, construction and demolition of buildings (Lukman et al., 2009).

Higher education institutions can be described as microcosms of environmental problems facing the larger society in numerous ways. Hazardous chemicals used in laboratories, fertilisers, insecticides, and pesticides are abundant on campuses, and can contribute to pollution. Chemicals depleting the ozone layer, causing increased human, animal, and plant exposure to ultraviolet radiation, are common in cooling and refrigeration systems, automobiles, libraries, and fire extinguishers. Furthermore, transportation to and from campus can lead to congestion, noise, and air quality problems for local communities. Universities and colleges also generate vast amounts of radioactive, solid and hazardous wastes (Creighton, 1999). In cold regions of the world, the largest environmental impacts caused by HE institutions are probably the carbon dioxide emissions and the air pollutants resulting from the burning of oil and natural gas to heat water and to regulate the temperature of buildings (Creighton, 1999). By implementing ‘greening’ actions on their campuses, HE institutions can reduce the cumulative effect of these environmental problems, and thereby prevent environmental degradation. As many future leaders attend colleges and universities today, HE institutions have the potential of teaching environmental literacy to the politicians, teachers, and decision-makers of tomorrow. Both in the classroom and by the example of its physical plant, a university can give students an understanding of the interrelationship between business decisions and the natural environment, and thereby model behaviours and attitudes that encourage environmental responsibility (Creighton, 1999).

At Rhodes University in South Africa, mean paper usage per academic staff member was calculated at 34 ± 20 new sheets per working day, of which 3% were trashed, 15% were kept

for later use (as scrap or printed on the opposite side) and 79% were given out as notes to students, filed as records or posted out as mail to other departments or institutions. It was shown that the university could save approximately US\$ 7000 per year for every 10% reduction in current use of paper. Rhodes University has an environmental policy and there is a waste management system for toxic and hazardous waste, but not for general waste streams. A local recycling company is commissioned and individual sections and departments usually separate paper at the source. However, there is no centralised and promoted system for recycling. Generally, paper and paper products are regarded as cheap products and are often undervalued as waste products. Because of this, much paper is wasted with minimal re-use (Amutenya et al., 2009).

An example of a university's commitment to greening is seen at the University of Memphis, where many modifications have been planned to increase energy efficiency throughout the campus. The old central boiler plant was removed and resulted in a saving of \$75 000 in utility costs. An estimated energy saving of over 5 million kilowatt hours of electricity was calculated for 2009. There was also a switch to the use of primary chilled water in the air-conditioning (Hellums, 2008). Furthermore, existing lighting will be replaced with new generation bulbs that use less energy and emit less heat to help reduce cooling requirements. Ultraviolet lighting systems will be installed in air conditioning units to reduce the biological build-up on air handling coils, reducing operating cost and improving indoor air quality. Also, the UV system will reduce the amount of chemicals needed to clean the coils. Energy saving upgrades will be made to the steam system to increase efficiency. The new systems in total will eliminate the need for steam heating for one section of campus. With an estimated savings of \$1 176 722, in 2009, this project has been calculated to reduce the University's carbon footprint by over 8 933 metric tons of carbon dioxide per year. The energy saved will be enough to power more than 1 160 homes each year. This is equivalent to removing 1 600 passenger vehicles from the roads or planting over 2 000 acres of forests each year. These green initiatives constitute a commitment by the University to achieve carbon neutrality through efforts such as reduced energy use, green building, and recycling (Hellums, 2008).

Practices in the facilities and operations areas at Ball State University have changed to include purchase of materials in bulk, management of the solid waste stream, reforestation of the campus, increased efficiency in energy usage, and use of bio-diesel and hybrid electric vehicles in the university fleet. The operational mantra is to celebrate, facilitate and anticipate

conceptual structure and discuss these at monthly meetings of the council on the environment. Progress is assessed and movement in the wrong direction is recognized, and adjusted accordingly. Hence, the words monitor, evaluate, and modify were added to the mantra (Koester et al., 2006).

2.6 Environmental management systems at universities

Creighton (1999) recognizes five key ingredients to successful university environmental action: Understanding how the university works; university commitment and demonstrated support for environmental governance, often articulated in an environmental policy; a university-wide environmental planning committee; individual leaders; and an understanding of the basic principles of environmental protection. The policy statement is a public declaration of the university commitment to environmental protection and serves as a framework for decision making and goals. When a policy is absent or is developed without broad input, efforts are said to be uncoordinated, and the result will be unfocused and short-lived. Whilst many corporate enterprises have well-established environmental policies, universities have lagged behind. Nevertheless some universities have adopted broad environmental policy statements.

At Ball State University a comprehensive whole-systems approach was used to institutionalize its ongoing greening of the campus. This approach bridges academic content, administrative policies and facilities management practices. It enables a campus wide unfolding of education for sustainability. Tracking the history, evaluating the progress, modifying the approach and continually refocusing the effort are presented as essential to a whole-systems approach. Descriptions are provided of committee work, international conferencing, environmental literacy programmes, campus planning, policy making, interdisciplinary curricular initiatives, and selected courses developed specifically for the respective academic disciplines. By 'whole systems,' it is implied that the entity of a university is composed of interdependent components that mimic a complex ecosystem. To operate in a sustainable manner, all the functioning components and linkages within the whole system must be considered. Greening of the campus principles have been incorporated into the university's strategic plan. A council on the environment has been created with

representation from every administrative and academic section as well as the larger public (Koester et al., 2006).

There is an ongoing debate in the campus environmental management system literature about the utility of the International Organisation for Standardisation (ISO) 14001 certification and model for higher education systems. ISO is a uniform international environmental management standard. The overall purpose of the standards is to assist companies and other organisations to develop their own proactive management systems, which take into account environmental issues and concerns, and which allow future benchmarking in relation to safe environmental practices. There are numerous advantages when an organisation voluntarily adopts the standards (Fisher, 2003), because it is indicated that the company complies with legislation, is competitive and observes safety regulations.

To evaluate the environmental performance of the Faculty of Engineering at the University of Maribor, Slovenia, a life cycle approach (LCA), which is based on the ISO 14001 series was used (Lukman et al., 2009). The current waste management practice at the educational institutions in Slovenia is to landfill 96% of waste. This is causing various environmental impacts. A study suggested that a combination of 70% recycling, 29% incineration and 1% landfill could reduce global warming potential by 47% (Lukman et al., 2009). In order to reduce the environmental impacts various heating improvement options have been considered, such as replacing the conventional gas-fired boiler with a combined wood and solar heating system. The LCA methodology uses the LCA software package GaBi® (Lukman et al., 2009). The authors further showed that there was potential for improving the environmental performance and reducing the costs of the university operations. They emphasized the importance of education by teaching what they preach as well as community outreach (Lukman et al., 2009).

2.7 Transportation

Current modes of transport consume more than half of global liquid fossil fuels and thereby emit nearly a quarter of the world's energy related to CO₂; generate more than 80% of developing cities' air pollutants; result in more than 1.27 million fatal traffic accidents, mostly in developing countries; and produce chronic traffic congestion resulting in time and

productivity losses (Sukhdev et al., 2010). The United Nations Environmental Report has further stressed the seriousness of the problem, and especially so in developing countries. It is estimated that further growth in the global fleet of vehicles is set to increase from around 800 million at present to 2 to 3 billion by 2050, and that most of this growth will take place in developing and transitional countries (Sukhdev et al., 2010). A fundamental change is required which can be achieved by reducing trips and shifting to more environmentally friendly modes, such as public transport and non-motorized transport.

Environmental analysis consistently shows transport as being amongst the top three contributors to a university's ecological footprint. There exists a degree of variation between universities but, taken together, private vehicle use and air travel are amongst the worst contributors to a university's ecological footprint (Bonham and Koth, 2010). Transport is an area where universities can improve their environmental credentials and the introduction of emissions trading schemes (economic benefits) adds incentives for such improvement (Bonham and Koth, 2010). Furthermore, legal requirements concerning air quality, increasing congestion, lack of land for parking, the high cost of constructing parking structures, and the environmental impact of traffic, have necessitated that universities explore a range of environmentally appealing solutions to alleviate congestion and thereby comply with legislation. Some colleges in the US have encouraged a shift from cars to other modes of transportation, and in particular to cycling and walking. The partial replacement of university fleets with alternative fuel vehicles and technologies such as compressed natural gas or electricity is also being attempted by a growing number of universities, as well as the recycling of operation fluids (Koester et al., 2006).

Another important point stated by Tolley (1996) is that despite the need to drastically reduce car commuting, universities effectively subsidize continued car usage. Therefore the importance of the simultaneous promotion of 'green' modes and the restraint of 'red' modes of transportation is emphasized. A later study showed that colleges are clearly de-marketing automobile commuting and actively promoting alternative transportation modes such as cycling and walking (Balsas, 2003). In Atlanta, a city notorious for traffic congestion and poor air quality, Emory University is setting aside more than half of its campus as protected green space, working to create a bike culture, and providing incentives for its employees to ride buses powered by used cooking oil from its campus cafeterias (Mascarelli, 2009).

2.8 Energy and water consumption

Ninety percent of South Africa's electricity is generated from the combustion of coal resources. The remaining 10% is generated from a mix of nuclear, hydro-electric and renewable energy resources (Modise, 2010). This configuration -along with the scale and intensity of current operations- has resulted in South Africa becoming the 13th largest current emitter of anthropogenic gasses in the world. Furthermore, the demand for electricity presently outstrips its supply (Modise, 2010). Electricity demand in the US too is expected to grow by roughly 50% by 2030 (Hightower and Pierce, 2008). Using energy (electricity, gas) only when needed or with the most efficient technology helps to reduce the negative impacts on air quality and global warming. Efficiency practices should be applied to small and large-scale renovations and to electrical equipment, lighting, and heating and cooling equipment (Creighton, 1999). Some universities have already made major advances in shrinking their carbon footprints and improving efficiency. Green Mountain College in Poultney, Vermont, is building a combined heat-and-power plant that will supply 85% of heating to the campus and run on renewable biomass such as locally sourced wood chips. Green Mountain's student enrolment has risen by 14% since 2007, but its carbon emissions per student have decreased by nearly 20% (Mascarelli, 2009).

The University of Minnesota, constructed a large-scale wind-research turbine that supplies power to most of its buildings. In 2008, Middlebury College in Vermont completed a biomass gasification plant, which is expected to replace 3.8 million litres of heating oil (Mascarelli, 2009). Harvard University has more than 60 green building projects in progress. One of its building renovations resulted in a 35% improvement in energy efficiency and a 40% reduction in water use (Mascarelli, 2009).

In January 2008, General Ban Ki-moon urged business and political leaders to place the looming crisis over water shortages at the top of the global agenda at the World Economic Forum in an effort to prevent conflicts over the growing scarcity of freshwater supplies. By 2025, more than half the nations in the world will face freshwater stress or shortages, and by 2050, as much as 75% of the world's population could face freshwater scarcity. The United States alone uses more than 500 billion litres of fresh water per day for cooling electric power plants (Nature, 2008).

2.9 Electronic waste

Public-health problems and environmental degradation caused by recycling of old computer equipment could skyrocket in the next two decades, as increasingly wealthy consumers in countries such as India and China discard their obsolete hardware. Furthermore, it is predicted that in 6 to 8 years, developing countries themselves will be disposing of more old computers than the developed world (Yu et al., 2010). The problem comes from efforts to reclaim precious metals from circuit boards and wires using 'very primitive' methods. To obtain copper, for example, informal 'backyard' recyclers in the developing world simply burn off the insulation, producing a host of toxic chemicals from the burning plastic. And to obtain gold and other metals, circuit boards are treated with litres of nitric acid and cyanide. Hence the discarded waste acid and cyanide end up being dumped into local water or soils (Lovett, 2010).

The growing importance of ICT to the world economy has brought about a surge in demand for electronic equipment. The rapid advancements made in electronic technology render the useful life of consumer electronic products relatively short (Nnorom and Osibanjo, 2008). Waste from electrical and electronic equipment (WEEE) is one of the priority streams in waste management. Challenges faced by WEEE management are not only consequences of growing quantities of waste but also the complexity of WEEE due to a wide variety of products from mechanical devices and highly integrated systems. As a result the recovery of WEEE is very challenging (Lovett, 2010).

There has been an increase in the number of environmental policies and legislation focusing on the product development process with a view to reducing the environmental impacts throughout the lifecycle of a product from design and manufacture, through to consumption and eventual end-of-life (EoL) management. These policies and legislation are almost all based on the principles of extended producer responsibility (EPR). The EPR concept has become an established principle of environmental policy in many countries. EPR is a method of integrating sustainable development principles into international trade based on an international environmental law principle known as the 'Polluter Pays Principle'. This simply means that the polluter should be responsible for the costs of dealing with the pollution and its impacts on others (RSA, 2002). Increasingly, countries in Europe and Asia (Japan,

Taiwan) are putting in place EPR, where the manufacturer takes back the used products at the end-of-life (Nnorom and Osibanjo, 2008).

The developing countries are facing huge challenges in the management of WEEE which are either internally generated or imported illegally as used goods. Implementation of EPR in the developing countries has become necessary in light of the present high level of trans-boundary movement of WEEE into the developing countries and the absence of basic or state-of-the-art facilities for sound end-of-life material/energy recovery and disposal of WEEE (Nnorom and Osibanjo, 2008).

2.10 Summary

Campus environmental responsibility can be supported by several types of actions and learnings. It is important for environmental leaders to learn about the latest energy-efficient and waste reduction technologies and techniques. It is important also that university community members are offered opportunities to learn how they can reduce their impact on air, water and the environment at large. The university curriculum should also include the connection of each subject to environmental issues. The green university strives to undertake each of these types of environmental education.

Many university managers and administrators feel that environmental stewardship stops at complying with laws governing air pollution, water discharges and hazardous wastes. Greening a university calls for much more and simple compliance is only the beginning, not the end. The Green Office Week campaign shows strides taken by environmental stewards in the business sphere to inculcate environmental responsibility. There is so much that universities can do. As many of the people whose decisions will affect the future attend colleges and universities today, HE institutions have the potential of teaching environmental literacy to future politicians, teachers, and decision-makers. The methodology used to investigate greening at UKZN is described in the next chapter.

CHAPTER 3

Research Methodology

3.1 Introduction

Evaluating the environmental performance of a university is not a trivial task due to the complexity and diversity of the operations. Nevertheless, it is deemed important to estimate these in order to identify more sustainable options for reducing the environmental footprints. The study was conducted at the University of KwaZulu-Natal. This chapter will describe the study area, data analysis, the research design and preparation of the instrument.

3.2 Background of the study area

The University of KwaZulu-Natal (UKZN) is situated in the province of KwaZulu-Natal on the eastern side of South Africa, and is comprised of 5 campuses located in Durban, Pinetown and Pietermaritzburg. These are: Howard College, and The Nelson R Mandela School of Medicine in Durban; Westville Campus in Westville; Edgewood Campus in Pinetown and Pietermaritzburg Campus in Pietermaritzburg. UKZN was formed on 1 January 2004 as a result of the merger between the University of Durban-Westville and the University of Natal. These two universities were among the first to merge in accordance with the government's restructuring plans to reduce the number of higher education institutions from 36 to 21. At UKZN a large student group, primarily in the adolescent and young adult age range exists alongside a typically much smaller staff group. The student population in April 2010 was 41121 and a total of 4321 staff members comprised of 1652 Africans, 1364 Indians, 953 Whites, 154 Coloureds and 198 categorized as 'other'(UKZN, 2010b) served the university. The university has 4 colleges, 23 administration and support divisions and 52 academic departments/schools. Most of the students are registered on a full-time basis and approximately 20% live in the university's residences. The university is a signatory to the Talloires Declaration and has an environmental policy which was ratified in 1998, but is currently under re-construction toward the formulation of an environmental management plan.

As a means of study, surveys of staff, students and the university community has been shown to be effective. For example, in order to gain a better understanding of the attitudes and behaviour of a campus community toward a recycling scheme, a survey of 1400 students and staff, at Massey University, New Zealand was conducted (Kelly et al., 2006). In another study, the researchers used a web-based survey to help develop an understanding of the campus community's perceived barriers to recycling, recycling knowledge, programme preferences, and environmental attitudes (Kaplowitz et al., 2009). In order to assess greening within the areas of energy and solid waste management, barriers to further greening and how such barriers can be reduced, or overcome, a survey was carried out on a sample of higher educational institutions within London, UK (Dahle and Neumayer, 2001). An initiative of the 'Green Office week' in the UK lead to a national survey to determine the views of office workers on helping the environment Avery (2010 a, b).

Seeing as no previous 'greening' studies were conducted at UKZN, it was decided to obtain information from as many staff members as possible, and the most convenient way was by means of a web-based survey using the on-line software programme QuestionPro.

3.3 Aim and objectives

The aim of the study was to assess the current 'greening' status at UKZN, and then evaluate staff support for facilitating 'greening'. The objectives of this study was to determine the current greening initiatives by staff and the university, staff support for greening and whether there are demographic differences in attitudes towards greening. The key questions driving this research are:

- How do staff contribute toward greening UKZN?
- What can be done to facilitate greening at UKZN?
- What do staff prioritize as greening projects?

3.4 Data collection strategies

3.4.1 Questionnaire

Following ethical clearance (APPENDIX 1) from the university to conduct this research, the survey was constructed and comprised a cover-letter and a questionnaire (APPENDIX 2).

The cover-letter provided information about the nature of the investigation and reasons for conducting it, and served to seek prior consent of the respondents. Following gatekeeper's approval from the Registrar (APPENDIX 3), the survey was published on the UKZN on-line notice system for staff to access, using the link: <http://questionpro.com/t/AD0S9ZHWXB> (UKZN, 2010c). All UKZN staff members had access to the internet therefore every staff member was given the opportunity of participating. Cleaning staff and other casual contractual workers were excluded.

3.5 Research design and methods

3.5.1 Description and purpose

The research was designed to be a census survey that sampled all staff members. The purpose of a census survey was to obtain comprehensive and unbiased data. As it is usually not possible to attain a 100% response, the sample size (n) was calculated at 353 with a staff compliment (N- the target population) of 4321, at the 95% confidence level and 5% error, using an on-line survey random sample calculator (CustomInsight.com, 2010).

3.5.2 Construction of the instrument

The questionnaire was designed to obtain demographic information about the respondents, whether or not they contributed to greening, the nature of their contributions, reasons for apathy and suggestions to facilitate greening. Staff were also asked about current and possible future modes of transportation to the workplace, as well as questions about computer replacement. Due to the qualitative nature of the survey responses, age, gender and race were categorized and scored for the purpose of quantifying the information (APPENDIX 2).

3.5.3 Reliability of the questionnaire

The reliability of the statements used to assess 'greening' at UKZN, viz: Collect used paper for re-cycling; Print on both sides of the paper; Print the final copy only; Return printer cartridges; Write notes on scrap paper; Switch off computer after work; Switch off lights after work; Report leaking taps; Indigenous gardening; Animal care, was tested using the software programme Statistical Package for Social Sciences (SPSS) Version 15, by

determining Cronbach's alpha. In order to determine validity, a goal standard method for determining greening is required. Since there is no goal standard method for determining greening it was not possible to determine the validity of the questionnaire.

3.5.4 Administration of the questionnaire

Staff completed the survey when it became available on-line via the notice system. E-mail reminders were sent to staff on a weekly basis to garner more support. The number of completed questionnaires was closely watched so that the survey could be closed when the appropriate sample size (n= 353) was attained.

3.6 Data analysis

The software programme QuestionPro has a built-in data analysis facility. As data is entered it is processed and stored, and may be exported as charts in MS Word format, spreadsheets and graphs in MS Excel format, or as a SPSS data file. Furthermore, QuestionPro has a cross-tabulation facility that can compare any two variables to show the relationship between them. However, it was not possible to verify the validity of these cross-tabulations, because the p value was not given, hence the data of this study was exported as a SPSS data file and was further analysed using the software package Statistical Package for Social Sciences (SPSS) Version 15. When the Chi square tests were not valid (when 20% or more of cells had expected counts of less than 5), following analysis using SPSS, then Fisher's exact test was conducted.

3.7 UKZN utilities, paper and recycling data

Annual typing paper usage and costs were obtained from the central Procurement and Buying Office, and the electricity and water consumption from the central Finance Creditors' Division. Recycling and staff and student demographic data and were obtained from the university webpages.

3.8 Summary

With ‘greening’ projects dotting the landscape of higher education, it is encouraging to observe the commitment of universities toward the future environmental viability of the world. A comprehensive university-wide study will give better insight into the ‘greening’ scenario at UKZN and will help to facilitate decision making on sustainable development programmes. Such programmes require hard and dedicated work from all segments of the institution, as well as an expansive vision that involves developing effective partnerships. UKZN may be described as a small city with over 45 000 inhabitants who need light, power, water, and air to maintain a satisfactory environment. How these utilities are maintained and operated can have an impact on both the environment and cost.

The results of this study will reveal the attitudes of UKZN staff toward greening. Furthermore, paper products constitute a large proportion of the solid waste generated by tertiary education institutes, due to the nature of the educational endeavours. In this study staff were asked about paper usage, and it would be interesting to learn about their ‘greening’ efforts and suggestions for facilitating greening. Information about greening apathy in staff would also contribute to better decision making for policy formulation and implementation. E-waste is a growing problem world-wide and the questionnaire attempted to address this indirectly by asking about the frequency of computer replacements. Current modes of transport consume more than half of global liquid fossil fuels and emit nearly a quarter of the world’s energy related to CO₂ (Sukhdev et al., 2010). In the light of this serious concern, the study surveyed the staff to determine whether they are keen on sharing their vehicles or whether they are more in favour of using a communal staff transportation system, as a way forward. The findings of the survey will be fully explained in the next chapter.

CHAPTER 4

Results

4.1 Introduction

A comprehensive account of the findings of this study is presented in this chapter. The reliability of the study, sample size and relevance to the population (N) have been explained. Data on the age, gender and race distribution of the respondents is then described. Thereafter, information on the greening projects, reasons for apathy, cross- tabulations between selected variables, transportation and computer usage are described.

4.2 Reliability

Cronbach's alpha was calculated at .902. This indicated that the questionnaire was very reliable. The closer the alpha value is to 1, the greater the level of reliability (Gliem and Gliem, 2003). Despite several appeals, the staff response rate did not increase. Therefore the results of the survey were more conservatively described and relate more to the group who were interested in greening rather than the entire university staff.

4.3 Data analysis

The online 'UKZN Greening' questionnaire was placed on the UKZN on the notice system between 23 April and 17 June 2010 when the data was downloaded. A total of 503 staff members viewed the questionnaire. Off these, 372 started the survey and 222 completed it. Despite several reminders to staff, the desired sample size (n=353) of completed surveys was not attained. Following computation using the survey random sample calculator (CustomInsight.Com, 2010), the sample (n=222) represented a 6.4% error at the 95% confidence level. The data of this study is described below with the use of graphics.

4.3.1 Age distribution of the respondents

The majority of the respondents (61%) were between 40-59 years of age (Figure 4.1). 74% of the respondents were female and 26% male.

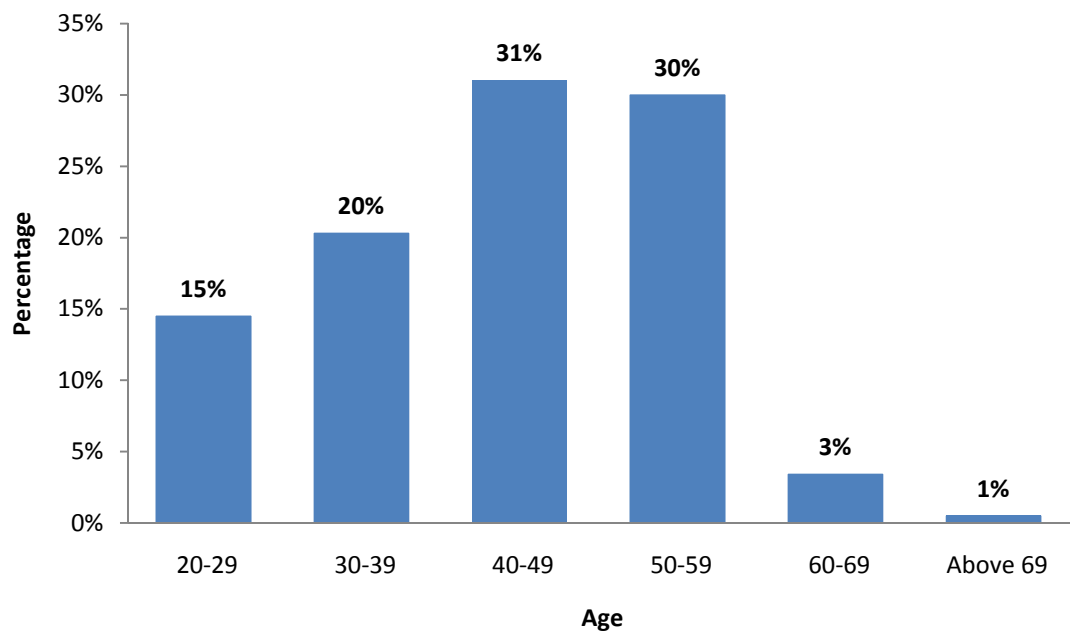


Figure 4.1: Age distribution of the respondents

4.3.2 Race distribution of the respondents (n) compared to population (N)

Coloureds, Blacks, Indian, White and 'Other' ('Other' in the race category refers to individuals who are neither White, Indian, White, Black or Coloured), currently comprise 4%, 38%, 32%, 22% and 5% respectively, of the population at UKZN. However in the survey, representation per race group was 2% Coloured, 12% Black, 42% Indian, 40% White, and 4% 'Other' (Figure 4.2).

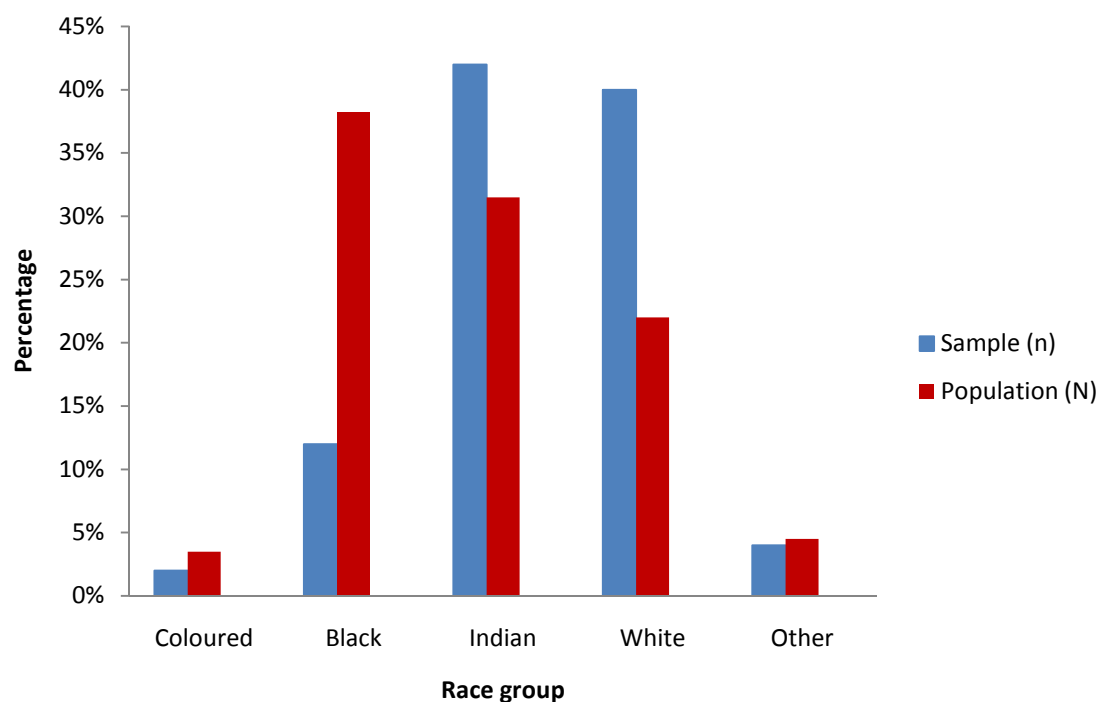


Figure 4.2: Race distribution of respondents in sample (n) compared to population (N)

4.3.3 Greening contributions by staff at UKZN

Greening was considered important by the majority (97%), but only 67% of the respondents actually contributed towards greening UKZN. In this respect, switching off lights was most practised (14.7%), followed by switching off computers after work (12.9%) and writing notes on scrap pieces of paper (12.3%). Other greening practices in order of staff popularity included the collection of used paper for re-cycling, the reporting of leaking taps, printing on both sides of the paper, and returning printer cartridges. Least selected greening practises were printing of the final copy only, indigenous gardening and animal care (Figure 4.3).

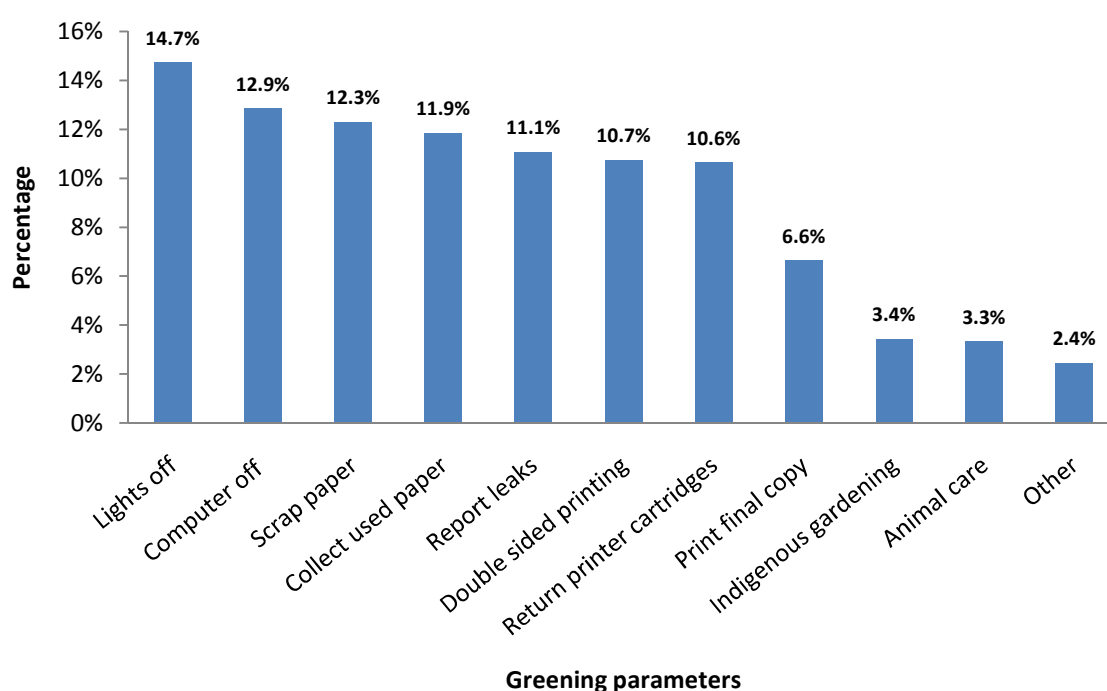


Figure 4.3: Greening contributions by staff at UKZN

4.3.4 Other greening activities

Other greening activities included, conservancy memberships and involvement in the UKZN environmental committee, worm farming and composting, tree planting, vegetable gardening, environmental education, collection and recycling of glass, bottles, cans, plastics, toys, batteries and materials from home, cycle to work, walks across campus, printing as little as possible and in black and white, and purchase of IT equipment that uses less power and therefore are more environment friendly.

4.3.5 Importance of greening

97% of the respondents indicated that greening was important, mainly because they wanted to conserve resources (31.5%) and were, in general, in the habit of conservation practices (23.5%). Saving costs scored 21.5% followed by ‘greening is my concern’ (21.1%) in ranking of choices for reasons for the importance of greening. Interestingly, under other the respondents said that green was peaceful; that they were concerned about the sustainability of the planet; that it was morally right to be green; that greening was a key factor in reducing pollution; that both green universities and green citizens were required; that our very survival depended on treating the planet correctly; that staff should influence students positively; and that they were parents (Figure 4.4).

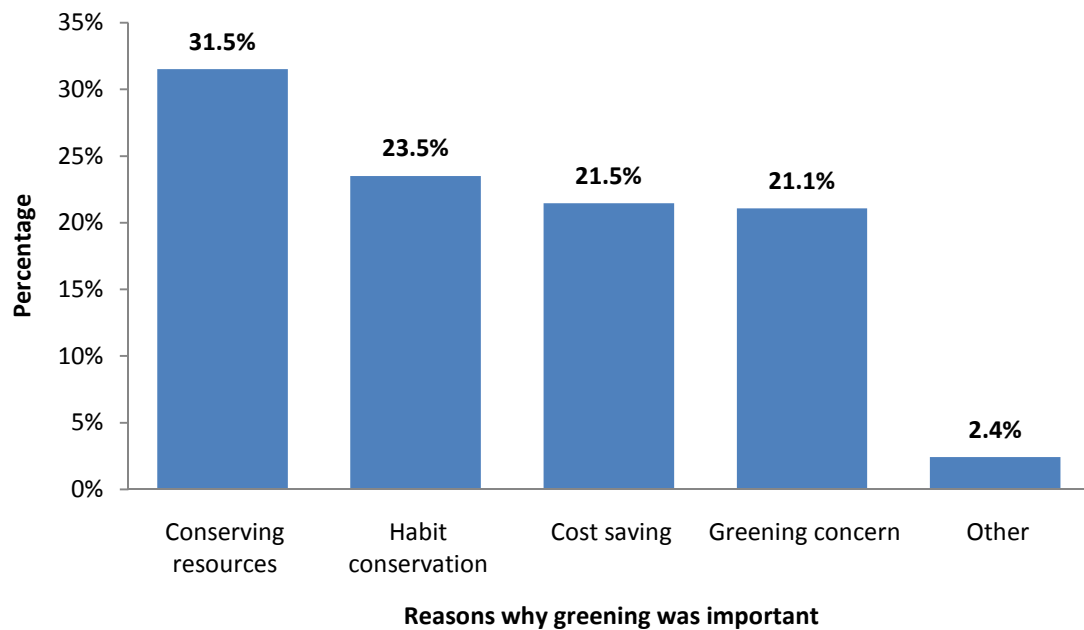


Figure 4.4: Reasons why greening was important

4.3.6 Reasons for non-contribution to greening by staff at UKZN

33% of the respondents did not contribute to greening at UKZN, and the most popular reason given was that there was no greening procedure in place (30.6%), followed by there being no greening policy to provide guidance (26.5%). The staff also indicated that time was a hindrance because their jobs absorbed all of their time (12.2%). Of less relevance to the lack of greening contributions by these staff were that they were 'too busy', lacking in quality time, or not in the greening habit. The lack of incentives was not regarded a barrier (Figure 4.5). When asked to provide other reasons for their non-contribution, the respondents firstly questioned the very meaning of greening and what constituted greening activities. They further attributed their apathy to a lack of stewardship, information-sharing and assistance by the university.

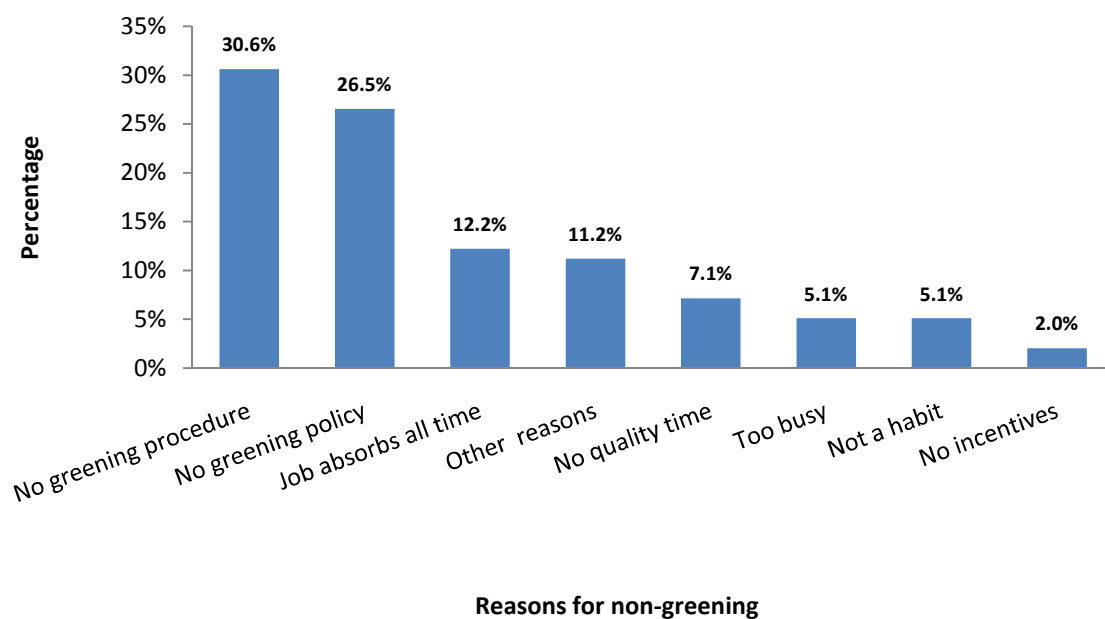


Figure 4.5: Reasons for non-contribution to greening by staff at UKZN

4.3.7 Why greening was not important

The main reasons why greening was not considered important by 3% of the respondents, was that they were not in the habit of conservation practices (46.2%), followed by not achieving direct work benefit from greening practices (23.1%) (Figure 4.6).

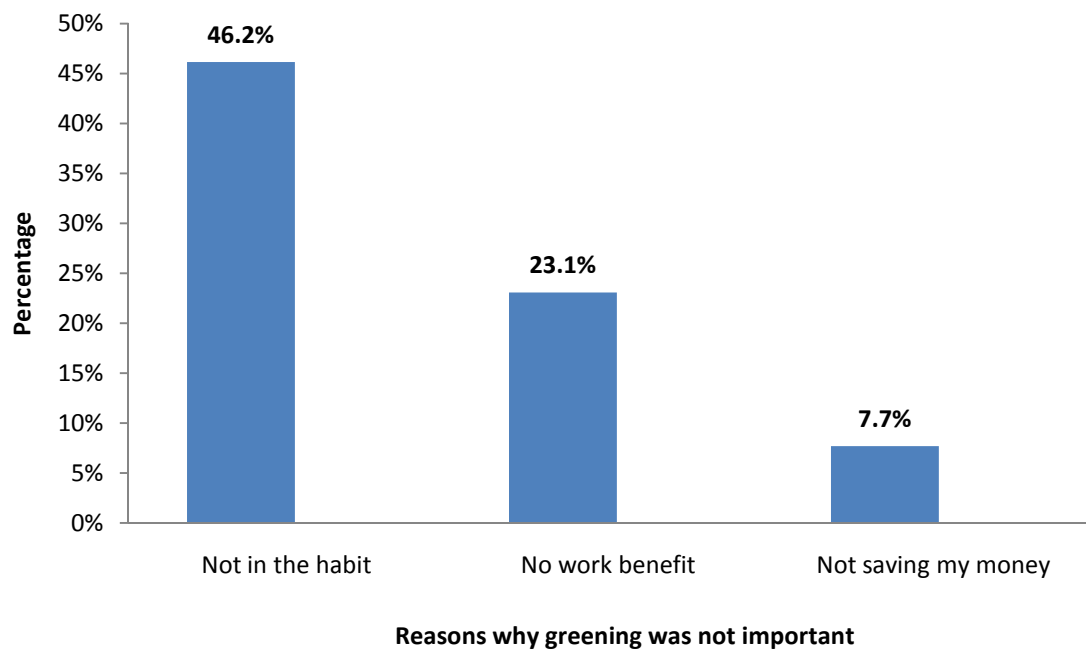


Figure 4.6: Reasons why greening was not important

4.3.8 Most important environmental factors

Concomitant with greening, staff were asked to rate three independent environmental factors, and the results showed that conserving the earth's resources and sustaining resources for future generations were equally rated as important and scored 45.8% each. Saving costs were considered least important and scored 8.4% as an overall ranking of importance by the respondents (Figure 4.7).

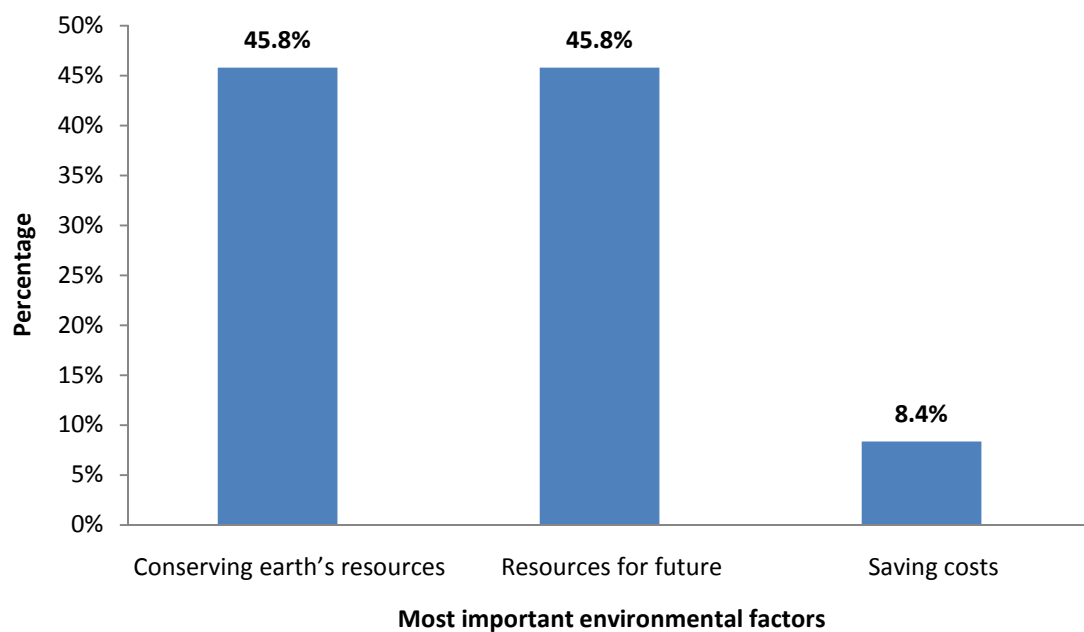


Figure 4.7: Most important environmental factors

4.3.9 Suggestions for greening UKZN

Staff choices for the suggestions given for greening UKZN are shown in Figure 4.8. There was interest shown in intensified re-cycling; teaching programmes; election of a dedicated team to manage greening projects, and a move to solar energy.

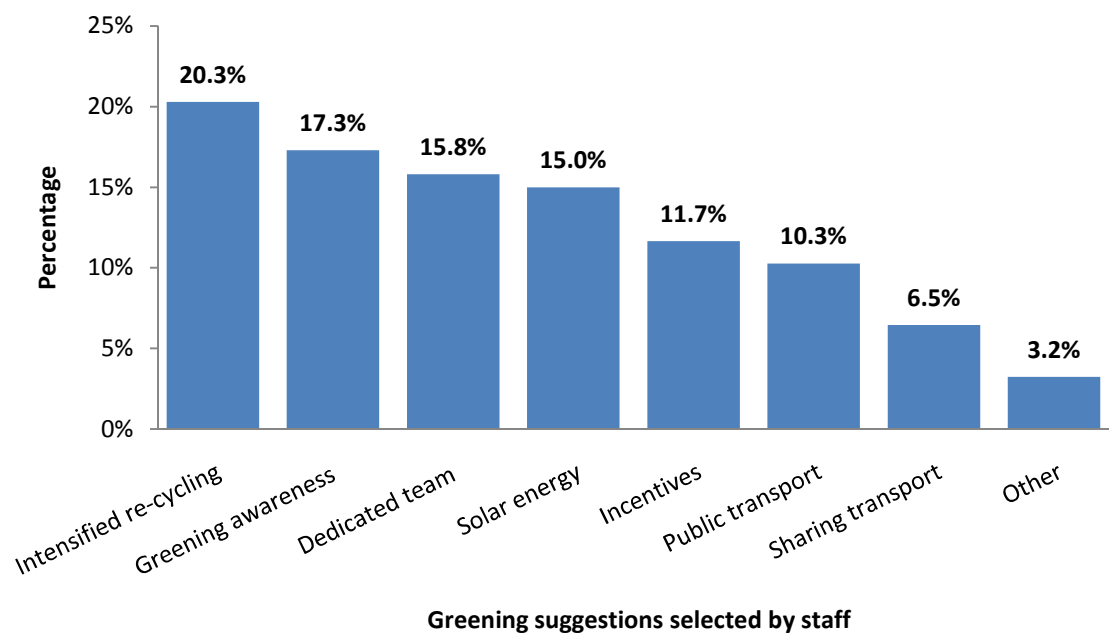


Figure 4.8: Greening suggestions selected by staff on the questionnaire

4.3.10 Other suggestions for greening UKZN

Under other, the respondents made several suggestions for greening UKZN which were combined according to their similarities and shown in Table 1.

Table 1: Other suggestions for greening UKZN

Suggestion	Number
Awareness campaigns and improved communication	4
Conservation of electricity/ paper and improved building operations	12
Encourage and reward 'greening'	1
Environmental Management Strategy/ Greening policy	15
Funding and support for more environmental/teaching programmes	2
Funding for and creation of conservancies	5
Learn from other organisations/other university	1
Organic gardening and water harvesting	6
Recycling depots	3
Reduce travel	3
Renewable energy	2
Support for cyclists and walking	5

4.3.11 Mode of transportation

The vast majority of the respondents (79.2%) travel to work by means of their own transportation. Sharing of transport occurred in 11.6% of the sample. Public transportation, walking and cycling was used less frequently (Figure 4.9).

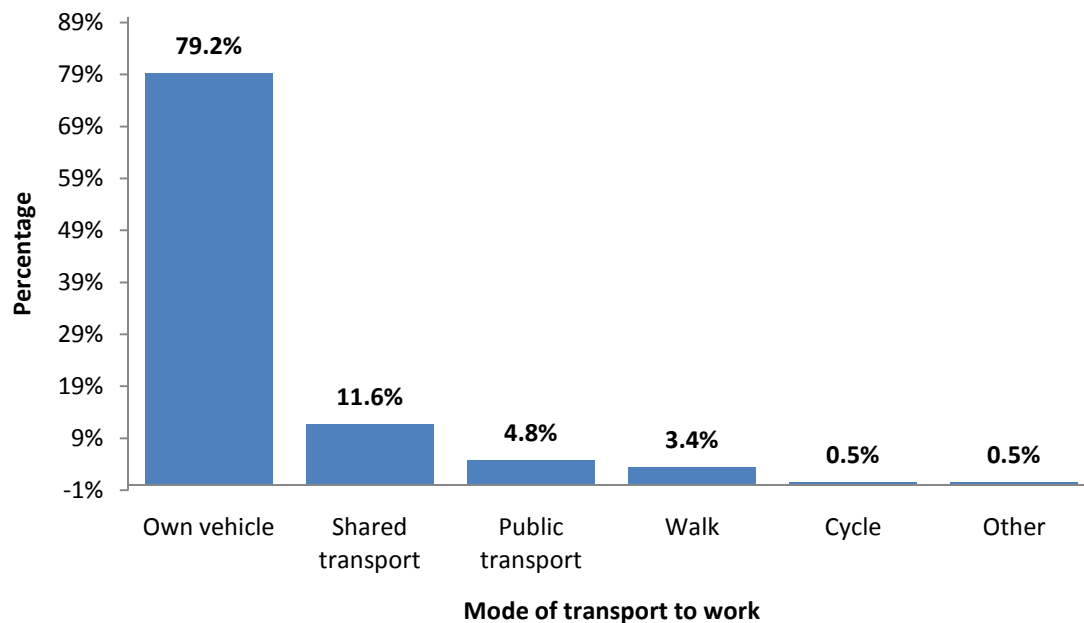


Figure 4.9 Mode of transportation to work

4.3.12 Alternative transportation

The results showed that there was more support for using a well-structured UKZN staff transport system (61.4%), compared to the sharing of privately owned vehicles (38.7%).

4.3.13 Computer usage

The majority of the respondents (97%) use a computer at work. In 3.5% and 15.5% of the cases, computers are replaced after two and three years of usage, respectively. At present only 41.5% of staff computers are replaced after 5 years. The survey revealed that 86% were agreeable to computer replacement after five years, which represented an increase of 44.5% compared to the current situation.

4.3.14 Race group in population (N) against number in sample (n)

In order to link demographic data with various variables to determine associations, cross-tabulations using SPSS Version 15 and Stata 10 were performed. When the number of respondents in each race group was cross-tabulated against the corresponding population of each race group, then $p = 0.001$, which indicated that there was a significant difference between the number who responded in relation to the number of staff at UKZN (N) in the respective race groups (Table 2).

Table 2: No. of staff per race group in population (N) cross-tabulated against number of staff per race group in sample (n)

Race group	% Population (N)	% Sample (n)	Expected counts %
Black	38.23	11.7	78.76
Coloured	3.6	1.9	7.3
Indian	31.57	41.7	65.03
White	22.06	40.3	45.43
Other	4.6	4.4	9.44

$$\chi^2 = 77.4386$$
$$p = 0.001$$

4.3.15 Race group against ‘in the habit of conservation practices’

When race group was cross-tabulated against ‘in the habit of conservation practices’ as a reason for greening importance $p=0.000$, which indicated that there were significant differences. Hence, there was an association between race groups and the habit of conservation practices, and Blacks, Indians, Coloureds, Whites and ‘Other’ differed in their response to this statement. The data revealed that the highest positive response for this statement (in the habit of conservation practices) was derived from Whites (77%), followed by ‘Other’ (67%), Indians (59%), Coloureds (25%), and Blacks (17%) (Table 3).

Table 3: Race group cross-tabulated against ‘I am in the habit of conservation practices’ as a reason for greening importance

Race group	‘I am in the habit of conservation practices’	
	% No	% Yes
Black	83.33	16.67
Coloured	75	25
Indian	40.70	59.3
White	22.89	77.11
Other	33.33	67.67

Fisher's exact = 0.000

4.3.16 Other cross-tabulations

When age was cross-tabulated against greening, Fisher’s exact test yielded $p=0.324$, which indicated that there was no significant relationship between the age of the staff member and his/her contribution to greening. Similarly, there were no significant findings between the following cross-tabulations using Fisher’s exact test:

Gender and greening ($p=0.610$).

Race group and greening ($p=0.402$).

Gender and no greening procedure in ($p=0.825$).

Gender and no greening policy ($p=1.000$).

Race group and conserving of resources as a reason for greening importance ($p=0.593$).

Race group and cost saving as a reason for greening importance ($p= 0.191$).

Race group and greening is my concern as a reason for greening importance ($p= 0.063$).

4.4 Recycling data

Recycling data was obtained from the university website (UKZN, 2010d; UKZN, 2010e; UKZN, 2010f), and is presented in Tables 4 and 5.

Table 4: Waste Recycling – Pietermaritzburg Campus 2007- 2009

Type	2007 (kg)	2008 (kg)	2009 (kg)
Aluminium	11	-	-
Batteries	52	135	-
Books	-	-	1140
Cans	4290	5260	2550
Cardboard	23300	22270	17570
Computers	-	730	-
Electrical ballast	25	-	-
Glass	12780	10920	-
Grade A white paper	24320	31540	39030
Plastic	710	450	830
Printer cartridges	20	111	33
Steel	10020	4980	5291
Total	75528	76285	77661

**Table 5: Waste recycling on the Pietermaritzburg Campus for the period
1 January – 30 June 2010, and on the
Westville Campus for the period 1 July to 20 August 2010**

Type	Pietermaritzburg (kg)	Westville (kg)
Batteries	160	-
Cans	1460	280
Common paper	-	600
Cardboard	9830	1400
Glass	12500	500
Grade A white paper	20 830	1200
Plastic	-	500
Plastic bottles	-	400
Steel	2960	-
Total	47 740	4880

4.5 Summary

Ninety seven percent of the survey sample indicated that greening UKZN was important but only 67% of the respondents contributed towards greening UKZN. In this respect, switching off lights was most practised (14.7%), followed by switching off computers after work (12.9%) and writing notes on scrap pieces of paper (12.3%). Thirty three percent of the respondents did not contribute to greening at UKZN. The most popular reason given was that there was no greening procedure in place (30.6%), followed by there being no greening policy to provide guidance (26.5%). The lack of incentives was not regarded a barrier. Instead, staff commented at length about the need for an environmental management system, a commitment from management, a budget, agreed principles, a strategic plan, establishment of working groups, implementation, monitoring and evaluation of the programme, publicity of the results, comparison of results with the original objectives, further modification of the objectives and priorities and repetition and maintenance of the programme. This indicated that the greening commitment by management may be lacking, and that the respondents were

keen to progress further. There was more greening support from the respondents with regard to agreement on less frequent computer replacements, and using a well-structured UKZN communal staff transport system.

CHAPTER 5

Discussion

5.1 Introduction

Higher education (HE) campuses often encompass large areas of land and are typically engaged in complex scientific, social, and educational activities with considerable material consumption and energy usage. As a result, universities may be viewed as communities with significant direct and indirect impacts on the environment (Alshuwaikhat and Abubakar, 2008). Likewise, through research, outreach, and leadership, universities may find solutions to challenges threatening human existence and the earth. Academic institutions worldwide have been engaged in promoting environmental sustainability for quite some time (Kaplowitz et al., 2009).

It is stated in the Talloires Declaration 2005, that universities must: 'Educate for environmentally responsible citizenship: Establish programs to produce expertise in environmental management, sustainable economic development, population, and related fields to ensure that all university graduates are environmentally literate and have the awareness and understanding to be ecologically responsible citizens' (ULSF, 2010: p1). Examples of environmental protection measures can be seen at most universities but professional environmental management systems which are efficient enough to reduce utilisation of resources are often lacking (Mbulingwe, 2002). The same is relevant for greening at UKZN where 97% of the respondents agreed that greening was important, yet only 67% actively contribute to greening and the main reason for non-contribution was that there was no policy and guidance in place. The original environmental policy which was ratified in 1998 is currently being re-constituted into an environmental management plan which may provide strategic and well-planned direction when it is implemented. Therefore the future prospect of better greening practices at UKZN looks promising.

Empirical studies have suggested various reasons why HE institutions may be reluctant to actively implement 'green' actions at their campuses. Causes mentioned are, among others, misconceptions of the meaning of sustainable development, the lack of environmental interest among students and staff, university conservatism, and the extensive costs associated with

implementing green initiatives. However, by implementing greening actions on their campuses, HE institutions can reduce the cumulative effect of environmental problems, and thereby prevent environmental degradation (Dahle and Neumayer, 2001). As many of the people whose decisions will affect the future attend colleges and universities today, HE institutions have the potential of teaching environmental literacy to future politicians, teachers, and decision-makers.

In 2008 there were 23 public HE institutions in South Africa, with a student and permanent staff population of approximately 850 000 (RSA, 2010b). With regard to their waste generation and consumption of energy and materials, South African universities may be comparable to large commercial concerns (Viebahn, 2002). The waste and material consumption could be reduced considerably by the systematic implementation of environmental management principles and systems, as the majority of waste produced by tertiary education institutions is recyclable (Armijo de Vega et al., 2003).

5.2 Recycling

At UKZN, the high quality printing paper usage for the period 01 June 2009 to 31 May 2010 was 65105 reams or 32 552 500 sheets, at a cost of R 2 million (US\$273 972) (V. Nundlal- Personal communication, University of KwaZulu-Natal, South Africa). According to the results of this study (Figure 4.3), staff were more careful about saving electricity by switching off lights and computers, than they were about saving high quality printing paper. At Rhodes University, it was shown that a reduction in paper usage could be achieved through an increase in re-use of paper and by printing handouts for students on both sides of the sheet. It was further calculated that a 40% reduction would save the university approximately US \$ 20 000 per year in direct costs (Amutenya et al., 2009). If the same were applied to UKZN, a 40 % reduction in typing paper usage would result in a 5.5 fold increase in savings when compared to Rhodes University, equivalent to (at current rates) US \$ 110 000 per annum.

In order to achieve this, the UKZN community needs encouragement on the re-use of paper. One way of encouraging long-term re-use and recycling behaviour is through information dissemination techniques (Shackelford, 2006) such as awareness raising campaigns (Grodzinska-Jurczak et al., 2006). The most popular choices selected by staff for accelerating

greening at UKZN were intensified re-cycling, and creating greening awareness through teaching programmes. The staff also called for fewer expensive publications on non-recyclable paper, the focus on 'reduce' and 'reuse' rather than just 'recycle', a variety of waste bins, the election of a dedicated team to manage greening projects, management commitment, a greening strategy, working groups, and to showcase the results of such efforts. The respondents repeatedly requested for recycling bins, and one comment read 'I could save three rainforests by recycling the paper I throw away each year!' Overall, the results showed that the university community was somewhat aware of the environmental benefits of recycling but lacked knowledge of the range of materials that can be recycled and the places on campus where these items can be recycled.

There was evidence too that effective dissemination of re-cycling information, i.e., locations of recycling receptacles, was lacking at UKZN as there were several requests for such communications. Yet there have been notices on the UKZN on-line notice system (UKZN, 2010f; UKZN, 2010g) that advertise recycling information. It seems therefore that the notice system mode of communication does not reach the target audience, and the suggestion by Grodzinska-Jurczak, (2006) of awareness raising campaigns may be better both for reaching a wider audience and for communication. Recycling programs that are poorly communicated have been shown to have lower participation rates than those supported by education and awareness efforts (Clarke and Maantay, 2006). Tucker (2001, in (Amutenya et al., 2009) reported that the main reasons for not recycling was the lack of access to a place to deposit recyclable materials. It has been shown that easy access to recycling receptacles results in significant increases in recycling behavior (Ludwig et al., 1998). Increasing the number of recycling bins will also increase accessibility by removing the distance barrier (Clarke and Maantay, 2006). It has also been stressed that increasing the number of recycling bins in each department should also be accompanied by awareness-raising campaigns, as people tend to react more when they are made aware (Bolaane, 2006 ; Grodzinska-Jurczak et al., 2006).

The lack of incentives was not regarded a barrier to greening by the respondents at UKZN, (Figure 4.5). However in order to facilitate further greening initiatives, greening rewards and encouragements were suggested and, Bolaane (2006) report that awareness could be complemented by direct incentives such as money targeted to the participants. Incentives were found to be successful in energy conservation projects (Clarke and Maantay, 2006). However, Fraj and Martinez (2006) concluded that people who recycle have a lifestyle that is

environmentally conscious, selecting and recycling products where the aim of protecting the environment (Fraj and Martinez, 2006).

In the current study, there was a significant difference between the number of respondents per race group and the number of staff (N) in the respective race groups. Furthermore, there was also an association between race groups and their habit of conservation practices, where Blacks, Indians, Coloureds, Whites and 'Other' significantly differed in their responses. The overall indication is that Whites are more in the habit of greening compared to staff from other race groups. It has been pointed out that although personal attitudes and social norms do have an effect on the success of recycling, these attitudes were influenced by having the opportunities to recycle as well as having the time and convenient environment to promote recycling (Tonglet et al., 2004). It may therefore be assumed that non-White people in this study have had little opportunity to recycle seeing as the recycling campaign has only just started at the previously Black Institution, now referred to as Westville Campus. It has been reported too, that demographic factors such as higher levels of education, high income, culture and liberal political orientation correspond positively with recycling (Hanyu et al., 2000).

Non-monetary and moral motives may be more important motivations to recycle than monetary motives, and this survey revealed that conserving of resources was the most important reason why greening UKZN was considered important. Furthermore, staff said that it was morally right to be green; that greening was a key factor in reducing pollution; that both green universities and green citizens were required; that our very survival depended on treating the planet correctly; that staff should influence students positively; green was peaceful; that they were concerned about the sustainability of the planet; and that they were parents. However, within the corporate environment, a financial incentive is considered a potentially important driver (Amutenya et al., 2009).

According to Robinson and Read (2005), the lack of understanding about a recycling programme differentiates recyclers from non-recyclers, the former tend to have more information about recyclable materials and where and when to take them than do non-recyclers (Robinson and Read, 2005). It was indicated that non-contributors to greening at UKZN lacked an understanding about greening, because they questioned the very meaning of greening and what constituted greening activities. They further attributed their apathy to a lack of stewardship, information-sharing and assistance by the university. Office workers too

admitted that the lack of empowerment, facilities and communication were the key reasons why they were not greener during working hours. 47% said that they were less conscious about reducing power consumption because they were not paying the bills (Avery, 2010b). As suggested by Kelly et al. (2006), in order to promote environmentally friendly behaviour, it is important for individuals to operate from truly integrated motivational factors, related to value and feelings that this behaviour is personally important rather than from doing it because of guilt.

Another potential paper saving strategy is for the University to make it a policy that all student handouts be printed on both sides of the sheet. In this way, paper usage could be lessened as was shown by Amutenya et al., (2009), where the daily requirement for 27 new sheets per academic for handouts could be reduced to only 13.5. Importantly, such a policy at senior management level will set the tone for all staff to participate.

5.2.1 Recycling at UKZN

Prior to the merger, there was an active paper recycling programme at the former University of Natal which in September 1998, was awarded second place in the service category of the Institute of Waste Management/EnviroServe Waste Minimisation. A recycling fund was established at the Nelson R. Mandela School of Medicine with income generated from selling waste paper and used cartridges. Students were allowed to access funds as short-term loans and were made aware of the source of these funds (UKZN, 2010d). Towards the end of year 2000, a waste company undertook the entire recycling function at Howard College, from collection to separation and sorting into recyclable and non-recyclable material. Hence there was little or no staff involvement and no income was generated despite the high success of this programme where the percentage recyclables was 80% or above (UKZN, 2010d). Mason et al. (2004) showed that an improved waste separation performance could increase the recycling rate (Mason et al., 2004).

Currently, robust re-cycling is still operational on the Pietermaritzburg Campus, and the data revealed a steady increase in the collection of recyclables from 75528 kg in 2007 to 77661 kg in 2009 (Table 4). Howard College still utilizes the services of the waste company, and at the Nelson R. Mandela School of Medicine, notices for the collection of used printer cartridges

are occasionally advertised on the UKZN on-line notice system (UKZN, 2010g). The money raised is used to manage the feral cats on various campus sites. However, a recycling programme has only just begun on the Westville Campus, where a separation at source system has been implemented (Table 5). In compliance with the Occupational Safety and Health Act (RSA, 1993), regulatory measures are in place on all 5 campuses for the disposal of all radioactive, toxic chemicals and biohazardous waste, where the services of a specialist company is employed.

As discussed above the staff of UKZN fall into several categories, especially relating to levels of education, knowledge of recycling, environmental consciousness and race and social background. Inculcating a recycling culture should have reasonable acceptance rates amongst staff. The survey revealed that many staff were pro-environmental, and recycling was shown to be rampant on the Pietermaritzburg campus. It may therefore be deduced that staff on that campus were better informed and therefore contributed more to recycling.

5.3 Environmental policy

The two most important environmental factors rated by staff were conserving the earth's resources and sustaining resources for future generations. Furthermore reasons for not contributing to greening at UKZN were that there was no greening procedure in place, followed by there being no greening policy to provide guidance. The university environmental policy of 1998 or the webpage of the UKZN Conservancy, are currently not available on the UKZN website, unless searched for in the archives. Therefore, by and large staff do not have ready access to information about environmental policy, plans or decisions at UKZN. Furthermore the new environment management plan is still under review. Therefore information about the decision making process, involvement, plans and policies on environmental issues at UKZN is currently lacking.

When staff were asked to suggest ways forward on the greening issue at UKZN, they overwhelmingly supported the establishment of an environmental management strategy (EMS). An EMS involves a continual improvement cycle that includes emergent plans, unrealized plans, and interactions between planning and implementation. An EMS with management support and student partnerships was shown to maximize the survival and

expansion of greening initiatives (Sharp, 2002). An EMS requires specific roles and responsibilities (Mason et al., 2003 ; Clarke and Kouri, 2009). These points were stressed by the respondents in the survey. Commitment from senior management leading to the formulation of an environmental policy is typically listed as the first step and modern systems are designed to facilitate continuous quality improvement through measurement of progress, with a feedback loop back into the environmental policy component (Sharp, 2002). The survey respondents repeatedly requested for such practices at UKZN. The full co-operation of all employees who are included in the changes taking place is also recognised as crucial, and it seems that UKZN staff would comply.

Use of the ISO standards has the added benefit of bringing the business world into the campus classroom. ISO 14001 contains the rules and roadmap for adopting an EMS, while ISO 14004 provides details and advice on how to get there. The adoption of an ISO approach in environmental management by educational institutions can be equated to a special campus business approach to environmental education. Businesses recognise the ISO logo, and are likely to respect the effort required for ISO certification. Consequently, there is likely to be greater cooperation and collaboration between business and UKZN. A greater degree of linkage has been requested by business, in terms of environmental management education (Topmba, 2010). Businesses provide scholarships, mentorship, and internships for environmental education. Examples in South Africa include, Unilever, Shell, ABSA, Sasol, and Grindrod. In return, businesses have requested establishment of more common standards, more consistent approaches to the environmental sciences among academic institutions, and greater linkages with industry. An ISO environmental approach could therefore benefit both businesses and academic institutions, resulting in a win/win scenario (Fisher, 2003). Clarke and Kouri (2009) evaluated several EMSs and found ISO 14001 to be best suited for HE institutes (Clarke and Kouri, 2009).

5.4 Transportation

Transportation to and from campuses can lead to congestion, noise, and air quality problems for local communities (Creighton, 1999). Growth of the global fleet of vehicles is estimated to increase enormously in developing countries, placing further strain on the environment. There is therefore a dire need worldwide, and more so in South Africa to reduce trips and

shift to more environmentally friendly modes, such as public transport and non-motorized transport (Sukhdev et al., 2010). As part of the greening drive at Ball State University there has been change to the use of bio-diesel and hybrid electric vehicles in the university fleet (Koester et al., 2006).

The vast majority (79.2%) of the survey respondents at UKZN travel to work by means of their own vehicles. Sharing of transport occurred in only 11.6% of the sample, and public transportation, walking and cycling were less frequently practiced (Figure 4.9). The need for change was apparent as there was greater support for using a well-structured UKZN staff transport system (61.4%), compared to the sharing of privately owned vehicles (38.7%). According to Trolley (1996) it would be more effective to provide incentives for staff to car-share (Tolley, 1996). Furthermore, the respondents requested for the reduction of travel between Pietermaritzburg and Durban and suggested more independent campus meetings. For inter-campus meetings, a greater use of the audio visual conferencing facilities was suggested.

Support for cyclists such as lock up spaces and cycle paths, showers, publicity and cycling events were other greening suggestions given by the respondents. Studies have revealed some factors that motivate cycling to campus which include physical and mental health, fitness, sustainability and affordability. Cycling to work is associated with less sickness absence. The more often people cycle to work and the longer the distance travelled, the less they report sick (Hendriksen et al., 2010). However there are other studies that report on the impediments of cycling such as time, safety, dealing with weather, pollution, cycle infrastructure and facilities, secure parking, shower and change facilities, cycle paths, and cultural norms, (Shannon et al., 2006) which were not expressed in this survey. The terrain in Pietermaritzburg is flat and therefore better suited to cycling. Durban and Pinetown on the other hand are hilly areas, and may therefore impede cycling to work. At present the physical environment on all UKZN campuses fails to acknowledge cyclists. Factors that are reported to discourage cyclists at other universities such as the provision of several hundred parking spaces for motor cars which are either free or low cost (Bonham and Koth, 2010), also exist at UKZN. To further encourage cycling, Bonham and Koth (2010) proposed an upward adjustment in pricing policy for car parking.

5.5 Energy and water consumption

5.5.1 Electricity

At UKZN, all equipment, motors, air-conditioners, lights and laboratory apparatus are electrically operated. A challenging growth trend is the rapid rise in energy consumption due to the proliferation of computers and associated technologies. Since 2008, student numbers at UKZN have increased from 37 478, to 39 370 in 2009, and currently stands at 41121 (UKZN, 2010b). Such growth trends at universities are known to increase the energy load on the system (Sharp, 2002). At Harvard University, electricity consumption, a key source of greenhouse gases has risen by a rate of 3% per annum (Sharp, 2002). It has been shown that modifications in present systems can lead to an increase of the energy efficiency throughout a campus. Cleaning at the University of Denver has shifted to early in the evening rather than waiting until midnight in the hope that the move will reduce electricity consumption (Anon, 2005). Conway et al., (2008) suggested that high-efficiency technologies for on-campus electricity generation should be further explored. Such has been accomplished at Malaga University in Spain where solar panels have been installed to produce a megawatt of energy to power the campus, in conjunction with a tri-generation power plant to convert waste heat into power. The university aims to eventually meet all of its energy needs through renewable energy. The University of the West of England also plans to use 100% of electricity from renewable sources (Mascarelli, 2009).

Switching off lights and computers after work was well practiced by the respondents in this survey, but the overall saving of costs (Figure 4.7) was considered less important than conserving the earth's resources and sustaining resources for future generations. However, the university spent R38,8 million (US\$ 5.4 m) and R11,9 million (US\$ 1.7 m) on electricity and water consumption respectively in the previous financial year (D. Arumugam- Personal communication, University of KwaZulu-Natal, South Africa). As part of a drive to reduce usage during the winter months of June, July and August, when electricity consumption is very high, the university embarked on an energy management scheme, similar to that described by Creighton (1999). Cost cutting measures have been implemented, and all bulk or chiller based as well as unitary standalone air-conditioning plants on all UKZN campuses were re-set to provide air-circulation only in accordance with the requirements stipulated by the Occupational Safety and Health Act (RSA, 1993). These interventions were implemented on weekdays during the hours of 07h00-10h00 and 18h00-20h00. In addition, electrical

heaters were switched off during this period or used very cautiously (UKZN, 2010h). Hence the high cost of electricity has necessitated swift change by the university. However, according to the responses there is still room for improvement.

Through this survey the respondents requested for timer switches on lights, a reduction in the number of lights/neon tubes on at any time, while maintaining sufficient light levels for work and safety, and a move to solar and other forms of energy. As mentioned above, Malaga University and the University of West of England have already embarked on renewable energy sources. The respondents also suggested improved insulation of buildings, mechanisms to calculate power savings and thereby compete with others, and more eco-friendly new building options. An audit that examines the billing records is well recommended for universities, but it may be difficult to identify the inefficient buildings because metering is usually done centrally (Creighton, 1999). The survey respondents requested for the purchase of IT equipment that used less power and therefore were more environmentally friendly. They requested for the shut- down of computers in student laboratories that were not in use after hours, and to print as little as possible, preferably in black and white. Notices too should be displayed to turn off lights, fans and air-conditioners upon exit.

Energy saving has been shown to effectively contribute to greening of HE institutions. At the University of Memphis existing lighting was changed to new generation light bulbs that use less energy and emit less heat to help reduce cooling requirements. Other improvements included a change to UV lighting systems in air conditioning units to reduce microbial contamination and operating costs. Furthermore, an energy upgrade in the steam system was selected as it would eliminate the need for steam heating for one section of campus (Hellums, 2008). At the University of Maribor, heating improvements included the replacement of the conventional gas-fired boiler with a combined wood and solar heating system. Again, the environmental performance of the university was improved whilst reducing the costs of the operations (Lukman et al., 2009).

5.5.2 Water

Historically water has been inexpensive, even in South Africa (Hightower and Pierce, 2008), but unpolluted sources are becoming scarce and water treatment is expensive (Creighton,

1999). It is much anticipated that water demand will outstrip water supply within the next decade (Blignaut and van Heerden, 2009). In South Africa, water shortage has already become serious and considerable water policy reform will be necessary. Climate change and invasive alien plants are likely to have a detrimental impact on the availability of existing water resources and are also likely to reduce the water supply. It is estimated that invasive alien plants by themselves could consume as much as 16% of water in the near future if left unchecked (Cullis et al., 2007).

Water conservation is guided by the National Water Act, No. 36 of 1998 which serves to ensure that the national water resources are protected, used, developed, conserved, managed and controlled in ways which take into account amongst other factors that meet the basic human needs of present and future generations (RSA, 1998b). At UKZN the respondents reported leaking taps more than they printed on both sides of a sheet of printing paper. They suggested the harvesting of water from the roofs for use in the gardens, and even recommended the creation of organic horticulture, where a no-pesticide policy was implemented, for students and staff to grow vegetables. Harvesting rainwater is said to be key to tackling the water crisis in the developing world because it is estimated that only 10–30% of the available rainfall is being used in a productive way (Nature, 2008). It is well known that hazardous chemicals used in fertilisers, insecticides, and pesticides can contribute to pollution. Importantly, there were requests for the acquisition of protection status for the remaining indigenous areas on the campuses, such as the forest (and grassland) at the Innovations Centre so that it was protected from landscaping attempts. This forest supports a wealth of bird life, banded mongoose, genets and other life, and would benefit from more proactive eco-management. Indigenous vegetation is better adapted to the harsh South African climate and therefore has lower watering needs. This is a very important point raised by the survey respondents because indigenous areas vastly decrease the amount of water needed to sustain the plantings.

5.6 Electronic waste

The scope of products considered electronic (e)-waste often includes consumer electronics such as computers, cell phones, televisions, and audio/video equipment. This study focused on personal computers (PCs), mainly desktops, laptops and notebooks, but excluded servers.

Personal computer usage at UKZN is high and the university policy is to replace staff computers every four years. Presently there are approximately 10 000 PCs on all campuses of which 2000 - 2500 are replaced every year. The survey revealed that most of the computers at UKZN have a desk life of up to 4 years. In the U.S. computers have a 4-year average lifetime, 4-5 years in Japan, and 5 years in China (Yu et al., 2010). Lifespan is even shorter in Kenya where computers used in public universities lost memory after 2–3 years, largely because they were second-hand (Odhiambo, 2009). Furthermore it was shown that a large number of these PCs were discarded in storerooms or left lying haphazardly in computer laboratories and offices. Users did not appreciate the need to collect computers for recycling to reduce e-waste. Obsolete PCs were donated to schools and other tertiary centres of learning (Odhiambo, 2009). At UKZN the ICT division together with the Assets section, disposes of PCs by offering staff members the option of buying, or by selling large batches to outside companies, and also by donating them to schools and non-governmental organizations (R. Murugan- Personal communication, University of KwaZulu-Natal, South Africa).

Electronic waste (e-waste) has emerged as a growing problem world-wide, especially in Africa. In order to effectively reduce generation and enhance the management of e-waste in Kenya, Odhiambo (2009) recommended that consumers should be sensitized on the significance of sound management of e-waste to encourage the collection and proper recycling of obsolete computers. 86% of the survey respondents were agreeable to using their computers for a 5 year period. Therefore the replacement policy could be extended by a year.

Motivations to address e-waste include rapidly growing waste streams, concern over the environmental fate of heavy metals and other substances in e-waste, and impacts of informal recycling in developing countries (Yu et al., 2010). Increasingly, countries in Europe and Asia (Japan, Taiwan, etc.) are putting in place laws that require the manufacturer to take-back the used products at its end-of-life (Nnorom and Osibanjo, 2008). Evidently this is not the case at UKZN, nor in Kenya (Odhiambo, 2009). As part of greening the university, it is recommended that the responsibility on e-waste management should be balanced between the manufacturers, suppliers/retailers, and the university in compliance with national and international regulation.

5.7 Summary

Switching off lights was most practised, followed by switching off computers after work and writing notes of scrap pieces of paper, as greening contributions. Other greening practices included the collection of used paper for re-cycling, the reporting of leaking taps, printing on both sides of the paper, and returning printer cartridges. It was evident that some of the respondents were conservancy members and had previous involvement in the UKZN environmental committee.

The respondents repeatedly requested for an environmental management strategy and action plan to better structure greening at UKZN. The importance of awareness campaigns, better communication and facilitated recycling were emphasized. Indigenous gardening, organic horticulture and a no-pesticide policy for campus gardens were also suggested. The staff were keen to use a communal automobile service and deliberated on the possibility of cycling as another mode of campus transportation. Overall the staff regarded intensified re-cycling, awareness and teaching programmes and the election of a dedicated team to manage greening projects as priority. The concluding remarks and recommendations of this study will follow in the next chapter.

CHAPTER 6

Conclusion and Recommendations

6.1 Introduction

There were many salient findings about greening at UKZN and the objectives of the study were achieved. Following analysis of the research data, it was possible to answer the research questions of this study as follows:

i. How are staff currently contributing toward greening UKZN?

The current greening projects at the UKZN included the re-cycling of materials and the conservation of resources.

ii. What can be done to facilitate greening at UKZN?

The respondents supported intensified re-cycling of various materials including glass and plastics. Numerous other greening suggestions for greening were made, such as the development of a staff transport system and, support for cyclists.

iii. What do staff prioritize as greening projects?

Briefly, 97% of the respondents agreed that greening was important and that an environmental strategic plan that obtained management commitment where principles and priorities were established in consultation with all stakeholders, and where working groups implemented the plan that was consistently monitored and evaluated, would spearhead greening at UKZN.

The data revealed that there were demographic differences in attitudes towards greening and that Whites were more in the habit of conservation practices. This chapter also provides an account of the conclusions of this study, the limitations that were encountered and makes recommendations for improvement as well as for future studies.

6.2 Conclusions of this research

The results of this study and the discussion have led to the following conclusions:

- Whites were more in the habit of greening compared to respondents in other race groups.
- Only 67% of the respondents actively contributed to greening.

- No greening policy and guidance were the main reasons for non-contribution.
- The respondents lacked knowledge of the range of materials and the venues on campus where these items could be recycled.
- There was ineffective communication.
- The lack of incentives was not regarded a barrier to greening contribution. However, incentives may facilitate further greening initiatives.
- Non-monetary and moral motives may be more important motivations to recycle than monetary motives.
- Conserving of resources was the most important reason why greening UKZN was considered important.
- The vast majority of the survey respondents traveled to work by means of their own vehicles.
- Sharing of transport occurred in only 11.6% of the sample, and public transportation, walking and cycling were less frequently practiced.
- There was greater support of the use of a well-structured UKZN staff transport system, compared to the sharing of privately owned vehicles.
- Timer switches on lights, a reduction in the number of lights and neon tubes on at any time, while maintaining sufficient light levels for work and safety, and a move to solar and other forms of energy, to further reduce the UKZN carbon footprint were requested for.
- The respondents supported the use of their computers from four to five years.

6.3 Recommendations for future studies

Based on these conclusions, the following recommendations have been proposed to green UKZN:

- Inform staff of the progress made on the Environmental Management Plan

The University of KwaZulu-Natal is a signatory to the Talloires Declaration and one of its goals is to ‘Conserve the physical environment, and foster a culture of responsible, ethical and sustainable use of natural resources’. Furthermore the 1998 environmental policy of the former University of Natal comprised of 14 principles that served as a strategic guide for an

environmental/greening commitment through teaching, research and conduct, for protection and conservation of the indigenous fauna and flora, controlled utilisation of natural resources, waste management and pollution control, amongst other items, is currently under review toward the formulation of an environmental management plan. Therefore the staff need to be informed of the progress made in this regard. Understanding how the university works, university commitment and demonstrated support for environmental governance, is often articulated in an environmental policy. The policy statement is a public declaration of the university commitment to environmental protection and serves as a framework for decision making and goals. When a policy is absent or is developed without broad input, efforts are said to be uncoordinated, and the result will be unfocused and short-lived. Commitment from senior management leading to the formulation of an environmental policy is typically listed as the first step and modern systems are designed to facilitate continuous quality improvement through measurement of progress, with a feedback loop back into the environmental policy component. The survey respondents repeatedly requested for such practices at UKZN.

- Management to show commitment and support for greening

Higher education institutions can be described as microcosms of environmental problems facing the larger society in numerous ways. Hazardous chemicals used in laboratories, fertilisers, insecticides, and pesticides are abundant on campuses, and can contribute to pollution. Chemicals depleting the ozone layer, causing increased human, animal, and plant exposure to ultraviolet radiation, are common in cooling and refrigeration systems, automobiles, libraries, and fire extinguishers. Furthermore, transportation to and from campus can lead to congestion, noise, and air quality problems for local communities. Universities and colleges also generate vast amounts of radioactive, solid and hazardous wastes. By implementing 'greening' actions on their campuses, HE institutions can reduce the cumulative effect of these environmental problems, and thereby prevent environmental degradation. As many future leaders attend colleges and universities today, HE institutions have the potential of teaching environmental literacy to the politicians, teachers, and decision-makers of tomorrow. Therefore it is important for UKZN management to show that greening matters are important and that there is commitment at senior level to address it. The rippling effect is that staff are likely to follow the good example set by management and this positivity is likely to permeate throughout the university community.

- Call for volunteers to facilitates greening projects/ Student involvement in greening projects

The survey respondents indicated their willing to co-ordinate environmental projects with regard to greening. There are several aspects to greening and it will be more effective to divide the work into separate projects. In order to better guide the work and effect delivery it would be more effective to call on volunteers seeing as there is much expertise at the university that can be drawn upon. Specialists therefore can group together to oversee specific projects such as indigenous gardening, animal care and new energy sourcing. Academic staff may include students in such projects and student contributions could be evaluated. A group of students on the HC have already embarked on greening projects and it highly recommended that such efforts are advertised and praised so as to encourage and attract more participation. However, it is noted that student involvement in greening UKZN was out of the scope of this study.

- Teaching programmes

The survey respondents reported on a general lack of information in so far as greening was concerned. In this study it has repeatedly been shown that an effective means of communication is by way of teaching programmes. Moreover, survey respondents made mention of previous involvement in teaching programmes. The university is ideally suited to promoting the teaching of environmental programmes as part of its core business. As practised in Japan, there is great opportunity at UKZN for introducing a 'Green MBA'. Projects can be linked to the 'green economy'. In that way future MBA students can investigate further greening projects, not only for degree purposes, but also for implementation which would lead to entrepreneurship and job creation.

- Develop a staff transport system

Current modes of transport consume more than half of global liquid fossil fuels and thereby emit nearly a quarter of the world's energy related to CO₂; generate more than 80% of developing cities' air pollutants; result in more than 1.27 million fatal traffic accidents, mostly in developing countries; and produce chronic traffic congestion resulting in time and

productivity losses. The need for change in the mode of transportation was apparent at UKZN as there was greater support for using a well-structured UKZN staff transport system. Furthermore, the respondents requested for the reduction of travel between Pietermaritzburg and Durban and suggested more independent campus meetings. Environmental analysis consistently shows transport as being amongst the top three contributors to a university's ecological footprint. Furthermore, legal requirements concerning air quality, increasing congestion, lack of land for parking, the high cost of constructing parking structures, and the environmental impact of traffic, have necessitated that universities explore a range of environmentally appealing solutions to alleviate congestion and thereby comply with legislation. Some colleges in the US have encouraged a shift from cars to other modes of transportation, and in particular to cycling and walking. Through this survey there was great appeal for promoting walking and cycling at UKZN.

Support for cyclists such as lock up spaces and cycle paths, showers, publicity and cycling events were other greening suggestions given by the respondents. Cycling to work is associated with less sickness absence. The more often people cycle to work and the longer the distance travelled, the less they report sick. The terrain in Pietermaritzburg is flat and therefore better suited to cycling. Durban and Pinetown on the other hand are hilly areas, and may therefore impede cycling to work. At present the physical environment on all UKZN campuses fails to acknowledge cyclists. To further encourage cycling, an increase in the parking price for motor cars may be introduced at UKZN.

- Practise e-waste management

Electronic waste (e-waste) has emerged as a growing problem world-wide, especially in Africa. In order to effectively reduce generation and enhance the management of e-waste it is recommended that consumers should be informed on the significance of sound management of e-waste to encourage the collection and proper recycling of obsolete computers. 86% of the survey respondents were agreeable to using their computers for a 5 year period. Therefore the replacement policy could be extended by a year. Motivations to address e-waste include rapidly growing waste streams, concern over the environmental fate of heavy metals and other substances in e-waste, and impacts of informal recycling in developing countries. Increasingly, countries in Europe and Asia are putting in place laws that require the manufacturer to take-back the used products at its end-of-life. Evidently this is not the case at

UKZN. As part of greening the university, it is recommended that the responsibility on e-waste management should be balanced between the manufacturers, suppliers/retailers, and the university in compliance with national and international regulation. Staff at the ICT Division at UKZN indicated that computer companies were agreeable to WEE management.

- Raise awareness campaigns

A major finding of this survey was the importance of raising awareness campaigns for creating greening interests. The Green Office Week campaign shows strides taken by environmental stewards in the business sphere to inculcate environmental responsibility. There is so much that universities can do. In this regard pamphlets, pod-casts, e-mails, television broadcasts, web notices and banners can be used as promotion tools. A special 'green day' can be allocated, and the campaign could be marketed in advance. When new students register at the university, special mention must be made of the 'green day' to develop an early interest in the young students.

- Evaluate and provide feedback on all greening projects

The most important aspect to any project is the feedback loop. The survey respondents especially requested for feedback. In this way staff effort would be better validated. When staff were asked to suggest ways forward on the greening issue at UKZN, they overwhelmingly supported the establishment of an environmental management strategy (EMS). An EMS involves a continual improvement cycle that includes emergent plans, unrealized plans, and interactions between planning and implementation. An EMS with management support and student partnerships was shown to maximize the survival and expansion of greening initiatives. An EMS requires specific roles and responsibilities. These points were stressed by the respondents in the survey. Commitment from senior management leading to the formulation of an environmental policy is typically listed as the first step and modern systems are designed to facilitate continuous quality improvement through measurement of progress, with a feedback loop back into the environmental policy component. The survey respondents repeatedly requested for such practices at UKZN. The full co-operation of all employees who are included in the changes taking place is also recognised as crucial, and it seems that UKZN staff would comply.

6.4 Limitations of the study

The extensiveness of greening as a topic, the poor response rate and possible partiality of the respondents to on-line surveys, and the UKZN notice system as a research tool, were regarded as limitations of this study.

- The extensiveness of greening

Greening includes discussion around climate change, greenhouse gasses, emissions, deforestation, sustainable development, conservation, energy demand and supply, renewable energy sources, freshwater scarcity, environmental protection, technology transfer and costs, environmental management strategies, legislation, business, government, universities, education, curriculum design, transportation, and others. To incorporate as many aspects in the questionnaire was difficult because it was important for the survey to be short and focused, rather than long and complex. Preliminary research showed that respondents lost interest when survey questionnaires required input that exceeded 7-10 minutes. Therefore information on some important aspects such as assessing mechanisms for creating awareness campaigns and how to implement specific greening programmes was not attained.

- Poor participation by staff in the survey

Only 222 staff members of a total of 4321 completed the survey. The indication is that the vast majority of staff is either not interested in greening UKZN, or alternatively, have little input in this regard.

- Staff partiality to on-line surveys

Staff identities may be traced via IP addresses. Therefore staff may have been reluctant to divulge information that could compromise their work situation.

- The UKZN notice system was not an ideal platform for conducting research surveys

It seemed that staff primarily used this facility for accessing current headlines and relevant work information, rather than for survey participation, as assessed by the number of views per advertised notice it.

6.5 Recommendations to overcome the limitations

The following are suggested for overcoming the limitations to this study:

- Design future studies to separately evaluate recycling, energy utilization, mechanisms for creating awareness, cost saving mechanisms and transportation. In that way more focus can be given to the individual components of greening in order to obtain more data that would lead to the development of better mechanisms forward.
- The use of hard-copy surveys that may be submitted to and re-collected from departmental secretaries or administrative officers, following completion.
- Use of short questionnaires that guarantee staff anonymity.

6.6 Recommendations for future research

In order to improve the responsiveness to greening, awareness campaigns and ‘green’ days are well recommended in the literature and were requested for by the respondents of this survey. Hence future studies should investigate the mechanisms of raising effective awareness campaigns, and ‘green days’. Another recommendation is to conduct research on the effective implementation of greening projects that involved staff, seeing as the respondents of this study indicated that work occupied all of their time.

6.7 Summary

The research question that underpinned this study was: What are the barriers to greening, and how can greening be facilitated at UKZN? There were various barriers to greening at UKZN mainly because there was no greening policy in place or procedure to provide guidance. T An environmental management strategy and action plan is currently under construction, therefore there are prospects of improved greening at UKZN. The University is a signatory to the Talloires Declaration and therefore is committed to environmental education, leadership and research.

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APPENDIX 1

Ethical approval



UNIVERSITY OF KWAZULU-NATAL

University of KwaZulu-Natal
Research Office
Govan Mbeki Centre
Westville Campus
University Road
Chiltern Hills
Westville
3629
South Africa

Tel No: +27 31 260 3587

Fax No: +27 31 260 2384

E-mail: naidoo4@ukzn.ac.za

29 March 2010

Dr N Singh
Graduate School of Business
Management Studies
Westville Campus
DURBAN

Dear Dr Singh

PROTOCOL: Creating a "Green University"

ETHICAL APPROVAL NUMBER: HSS/0148/2010 M: Faculty of Management Studies

In response to your application dated 18 March 2010, Student Number: **7407399** the Humanities & Social Sciences Ethics Committee has considered the abovementioned application and the protocol has been given **FULL APPROVAL**.

PLEASE NOTE: Research data should be securely stored in the school/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

Professor Steve Collings (Chair)
HUMANITIES & SOCIAL SCIENCES ETHICS COMMITTEE

SC/sn

cc: Prof. A Singh (Supervisor)
cc: Mrs C Haddon

APPENDIX 2

Questionnaire



UNIVERSITY OF KWAZULU-NATAL

Graduate School of Business

Westville Campus

Dear Respondent,

MBA Research Project

Researcher: Dr Nisha Singh Tel.: 031 260 7370

Supervisor: Prof A M Singh Tel.: 031 260 7061

Research Office: Ms P Ximba Tel.: 031 260 3587

I, NISHA SINGH an MBA student at the Graduate School of Business, University of KwaZulu-Natal invite you to participate in a research project entitled Creating a ‘Green University’. The aim of this study is to assess the current greening status at UKZN and then evaluate staff support for facilitating greening. Your participation in this survey will enable me to determine the current and continued contributions made by staff toward greening UKZN. Importantly, the study plans to investigate what staff prioritize as greening projects.

Participation in this project is voluntary. You may refuse to participate or withdraw from the project at any time with no negative consequence. There will be no monetary gain from participating in this survey group. Confidentiality and anonymity of records identifying you as a participant will be maintained by the Graduate School of Business, UKZN. If you have any questions or concerns about completing the questionnaire or about participating in this study, you may contact me or my supervisor at the numbers listed above. The survey should take you about 5-7 minutes to complete.

Thank you for time and participation.

Yours Sincerely,

Nisha Singh

Researcher

☐ I agree

1. Age

1. Under 20
2. 20-29
3. 30-39
4. 40-49
5. 50-59
6. 60-69
7. Above 69

2. Gender

1. Male
2. Female

3. Race group

1. Black
2. Coloured
3. Indian
4. White
5. Other

4. Do you contribute toward greening UKZN?

1. YES - Go to Question 5
2. NO - Go to Question 6

5. You answered YES to question 4, what do you do?

1. Collect used paper for re-cycling
2. Print on both sides of the paper
3. Print the final copy only
4. Return printer cartridges

5. Write notes on scrap paper
6. Switch off computer after work
7. Switch off lights after work
8. Report leaking taps
9. Indigenous gardening
10. Animal care
11. Other

6. You answered NO to question 4, why don't you contribute to greening UKZN?

1. Not interested
2. Does not make a difference to my life at work
3. No incentives
4. Not my problem
5. No greening procedure in place
6. No greening policy to provide guidance
7. Too busy
8. My job absorbs all my time
9. No quality time to dedicate to greening
10. Not a habit
11. Other

7. Is greening UKZN important to you?

1. YES - Go to Question 8
2. NO - Go to Question 9

8. You answered YES to question 7, what is/are your reason/s?

1. Conserving of resources
2. Cost saving
3. Greening is my concern
4. I am in the habit of conservation practices
5. Other

9. You answered NO to question 7, what is/are your reason/s?

1. Not saving my money
2. No direct work benefit to me
3. Greening is not my concern
4. I am not in the habit of conservation practices
5. Other

10. What is most important to you? Choose one.

1. Saving costs
2. Conserving the earth's resources
3. Sustaining resources for future generations

11. What are your suggestions for greening UKZN?

1. Intensified re-cycling of materials
2. Public transport system for staff
3. Sharing of private transport
4. Dedicated team to manage greening projects
5. Incentives for greening savings
6. Move to solar energy
7. Create greening awareness through teaching programmes
8. Other

12. What is your mode of transport to work?

1. Own vehicle - Go to Question 13
2. Public transport
3. Shared transport
4. Cycle
5. Walk
6. Other

13. Your mode of transportation to work is by means of your own vehicle, hence, are you agreeable to? Choose one.

1. Sharing your vehicle to transport other staff
2. Using a well-structured UKZN staff transport system

14. Do you use a university computer at work?

1. YES
2. NO

15. How often is your computer replaced? Choose one.

1. Yearly
2. Every two years
3. Every three years
4. Every four years
5. None of the above

16. Would you be agreeable to replacing your computer every five years as a contribution to greening UKZN?

1. YES
2. NO

Thank you for taking the time to complete the questionnaire.

APPENDIX 3

Gatekeeper's approval



1 March 2010

Ms N Singh
Graduate School of Business
UKZN

Dear Ms Singh,

RE: REQUEST FOR PERMISSION TO CONDUCT RESEARCH

Gatekeepers permission is hereby granted for you to conduct research at the University of KwaZulu-Natal towards your MBA qualification in the following research area:

1. Creating a "Green University"

I trust the data collected will be treated with confidentiality and anonymity.

Yours sincerely,

Prof J Meyerowitz
REGISTRAR

Office of the Registrar

Postal Address: Private Bag X54001, Durban, 4000, South Africa

Telephone: +27 (0)31 260 8005/2206

Facsimile: +27 (0)31 260 7824

Email: registrar@ukzn.ac.za

Website: www.ukzn.ac.za

Founding Campuses:

■ Edgewood

■ Howard College

■ Medical School

■ Pietermaritzburg

■ Westville