The role of Green Campus Initiative (GCI) as integral part of environmental and sustainable resources utilization: A case study of Durban University of Technology

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Hlanganani Siduduzo Shange

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Supervisor: Dr. DC Hlengwa Date: 02 November 2021

APPROVAL

Dr DC Hlengwa

Supervisor

Doctor of Technology in Business Administration (DUT); Master of Business Administration (MANCOSA); Master of Recreation and Tourism (UNIZULU); Post Graduate Diploma in Tertiary Education (UNISA); BA Hons (Geography); Bachelor of Pedagogics (UNIZULU).

02 November 2021

DATE

DECLARATION

I declare that this study:

The role of Green Campus Initiative (GCI) as an integral part of environmental and sustainable resources utilisation: A case of Durban University of technology, unless specifically indicated to the contrary in the text, is my own work in both conception and execution. All the sources of information used or quoted have been duly acknowledged by means of complete references.

Hlanganani Siduduzo Shange

30 November 2021
DATE

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DEDICATION

I would like to dedicate this master's dissertation to my precious daughter Khethelo Shange and my family. I did this as a token of appreciation for not causing any problem during this process. There is no doubt in my mind that without your encouragement, motivation, and counsel, I would not have completed this work.

Thank you, may God bless you all.

ABSTRACT

The Green Campus Initiative (GCI) is quite an old movement around the world, but it was only initiated in South Africa in 2012 by the Minister of Higher Education and Training, Dr Blade Nzimande. The reason behind the initiating this movement was to make institutions of higher learning mindful of the negative natural effects that are brought about by their everyday socio-economic activities. Moreover, the GCI movement looked to provide a platform for students to gain information and get involved in the movement for change and sustainability. Numerous universities in South Africa participate in GCI, but encounter numerous challenges and limitations, which curtail full-scale implementation and beneficiation.

The objectives of this study were to assess the progress on the Green Campus Initiative programs, examine the impact that the GCI has had at DUT, determine the challenges of implementing GCI at the DUT and investigate mechanisms of promoting GCI at DUT. Extensive literature review was conducted to locate the study within existing research. This study used qualitative research method, conducting interviews with some stakeholders and questionnaires to others. Data were analysed using qualitative techniques such as themes, words, word cloud, word trees and others.

The study found that while quite a number of activities had been done in the past to promote GCI and prizes won at interuniversity competitions, GCI at DUT was still facing a number of challenges. These challenges emanated mainly from the lack of environmental policy, which would enable the university to develop a fully-fledged GCI office. The study also discovered that academic departments were involved on an ad hoc voluntary basis resulting in some not promoting GCI.

ACRONYMS

ACUHO-I-SAC	Association of College and University Housing Officers International Southern Africa Chapter
APSCC	Association for Promoting Sustainability in Campuses & Communities
DUT	Durban University of Technology
GCI	Green Campus Initiative
HESA	Higher Education South Africa
IRIC	Institutional Research and Innovation Committee (IRIC)
SDGs	Sustainable Development Goals
SFA	Strategic Focus Area
UN	United Nations
UWC	University of Western Cape
WCED	World Commission on Environment and Development

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CHAPTER 1

INTRODUCTION AND ORINTATION TO THE STUDY

1.1 INTRODUCTION AND BACKGROUND

This chapter gives the background, the problem statement, the guiding research questions and objectives. It defines the main concepts and outlines the significance of the study. This chapter introduces that rationale for conservation and sustainability efforts globally as well as the history of Green Campus Initiatives (GCI) in South Africa. This chapter is important because it orientates the reader to what can be expected and creates an awareness of the main concepts of the phenomenon and subject of interest of the study.

Environmental problems are proliferating across the globe manifesting in increased climatic disturbances, global warming, acidic rain, deforestation, extinction of species, melting ice caps, rising sea levels, water, land and air pollution (Fonseca, Moura and de Almeida 2018), all rooted in human socio-economic activities (Nunez, 2019; Mohammadalizadehkorde and Weaver, 2018; Thondhlana and Hlatshwayo 2018). According to Ting, Bin and Choong (2012) global warming is not the only reason for sustainability. Other factors such as high energy price, uncertainty about future energy supply and increase consumption are associated with population growth. This provides empirical reason for the necessity to modernize conservation measures.

The universities are leading when is coming to energy consumption instead of inventing and providing solutions towards energy saving. Raworth (2017) highlights that over 30 percent of global energy is consumed by universities annually. In agreement Higher Education South Africa (HESA) (2014) states that in United Kingdom universities utilized 7.9 billion kWh of energy and produced 2.3 million tons of carbon emissions in 2014.

Khan (1996); Niina, Alexei, Trundle and McEvoy (2018) point out that several Universities have experienced conservation issues. Teah Yang, Onuki and Teah (2019) opine that university campus are regarded as small worlds. Aasa, Jesuleye and Ajayi (2020:82); Alshuwaikhat and Abubakar (2008: 2) announce that universities they are resourceful in a way that they can reduce their carbon footprint and would help promote environmentally friendly practices and improve disaster resilience of their local communities.

Mohammadalizadehkorde and Weaver (2018) argue that large institutions such as universities should reduce their consumption level to boost bottom lines. In agreement, Benjamin, Lawrence and Miranda (2018); Yanthi, Yunansah, Wahyuningsih and Milama (2018) are of the view that universities staff and students are at appropriate position to create significant impact on the environment through the GCI philosophy. GCI influence greening values and develops new paradigms of thinking about the environment. Yuan, Zuo and Huisingh (2013) concur by stating that the Chinese Government expects China universities to be in a forefront in implementing sustainability initiatives in China.

Findler, Schoherr, Lozano and Stacherl (2018) argue that many higher education institutions already started incorporating sustainable development into their systems. Fonseca, Moura, Jorge and Almeida (2018) posit that the Cornell's Ithaca campus decreased campus emission by 30 percent through energy conservation on the campus energy supply. Almeida (2018) also state that Ithaca university has created a culture of sustainability in their students and advancing climate change literacy. Several other universities have considered environmental issues and acted upon by putting tremendous investments into greening their campuses (Sonetti, Naboni and Brown 2018) through the collaboration of environmental concerns to their policies and daily operation of the institution.

The subject of interest in this study is responsible use of the environment, resources, and GCI with special reference to the Durban University of Technology (DUT). In South Africa GCI was adopted in 2011 during the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 17) held in Durban. The National Minister of Higher Education, Dr Blade Nzimande, formally constituted GCI in 2012 as a

framework for students to play their part taking ‘urgent action to combat climate change and its impacts’ (Anderson, Ryana and Sonntaga 2017: 2). Further objectives included helping ‘build the legacy of the COP 17 climate change summit’ (Brand South Africa 2012: 1), while also seizing business opportunities that could arise from the solutions they come up with (Moodley 2012; Brand South Africa 2012).

1.2 RATIONALE OF THE STUDY

The worldwide challenges of ozone layer depletion, global warming, changing weather patterns, droughts, deforestation, melting glaciers, rising sea levels, acid rain, reduction in agricultural yields, widespread health problems, air, water, land pollution, and loss of biodiversity have been receiving media and academic coverage for decades (United Nations 2012). Jaiswal and Joon (2010); Nunez (2019) point out that there are many temperature-dependent phenomena that suggest that the earth as it used to be known and experienced is changing drastically due to anthropogenic activities that produce higher greenhouse gases as populations grow, countries strive for better economies leading to increasing consumption of resources (Richardson 2018).

Richards (2018) further states that when consumption of resources exceeds bio-capacity, the regenerative capacity is exceeded. Corner and Pidgeon (2010) highlights the importance of communicating issues of climate change to encourage sustainable behaviour aimed at climate change reduction and mitigating the effects.

According to Benjamin, Kira, Lawrence, Miranda and Alexa (2018) universities have a crucial role to play in expressing the ways in which campus communities are shaping a sustainable vision of the future, reflecting on the visions and ideals they represent and generating new knowledge for sustainable development. The universities have the responsibility of inventing new knowledge regarding sustainability to breed an energy-efficient society while playing a leading role in behaviour-changing campaigns both on campus and in surrounding communities. After 2012, UN Conference on Sustainable Development confirmed the leadership role of higher education in education for sustainable development (United Nations 2012).

Findler et al. (2018: 1) vouch that 'institutions of higher learning are increasingly acknowledged as key drivers for the development of sustainable societies' that are tasked to demonstrate, promote and provide transformation within societies (Mafongosi, Vawuzie and Talukhaba 2018). Genta, Favaro, Sonetti, Barioglio and Lombardi (2019) regard GCI as the only plan to build and sustain culture of conservation among the universities, and their immediate communities, while Purushottan and Rwelamila (2015: 2) contend that GCI should become 'integral part of modern day's university system'.

1.3 SIGNIFICANCE OF THE STUDY

This study is significant because it plugs into some of the 17 United Nations' Sustainable Development Goals (SDGs) adopted in 2015 as the 'blueprint to achieve a better and more sustainable future for all' through addressing the global challenges such as climate change, environmental protection sustainable cities and communities and responsible consumption (UN website 2019; Weber 2017). Amos and Uniamikogbo (2016) maintain that sustainability and triple bottom line (earth, society, and profits) are related. For countries to achieve the SDGs, they must strive for environmental, social, and economic prosperity.

The study is significant in the era of burgeoning global problems (Zimmermann, 2016) and the importance of control strategies, environmental planning, legislation policy instruments and measures to enhance planetary resilience for current and future generations (Khan and Chang 2018; Pasillas, Uwase and Lundberg 2019).

Since the costs of inaction to combat climate change are even higher (Union of Concerned Scientists, 2010), the university leaders have to act soon and decisively. Gao (2017) supports the view that universities have a critical role to play in combating climate change through education, workshops, demonstrations, rallies, open meetings, innovation, and others. GCI is therefore globally significant and strategic to enable the graduates to attain such attributes as being environmentally and socially aware within local and global contexts (DUT Strategy 2014-2019) while also deriving entrepreneurial

opportunities and economic benefits from the solutions they helped develop (Balakrishnan 2018). In its strategic plan 2014-2019, two of DUT's Strategic Focus Areas (SFAs) were: Building sustainable student communities of living and learning and building a sustainable university. Strategic Driver E was Greening the university – by building a shared environmental consciousness and actively addressing the use of energy and water resources and improving consumption patterns (DUT website).

These SFAs and Strategic Driver E can be achieved through the intensification of GCIs. In its current strategy, named Envision 2030, DUT has four perspectives, one of which is *sustainability* aimed at delivering experience within an environmentally responsible and financially sustainable framework. The university hopes to achieve this by creating a future-oriented living and learning environment, engendering a sustainable and efficient business model, and improving the efficiency of resource utilisation and decreasing environmental risk. The sustainability perspective twines with the other three perspectives of stewardship, systems and processes and society. This means that the issue of environmental sustainability is enshrined at the highest strategic level of the university, which might marshal required GCI changes.

1.4 STATEMENT OF THE PROBLEM

Torkildsen (2005) argues that statement of the problem looks at what actually constitutes the problem in the context of available literature. According to McCombes (2019) an effective problem statement contextualises the problem, describes a precise issue of concern, shows the relevance of the problem, and then sets the objectives of research.

Accordig to Ntoyakhe (2018) and Anderson, Ryana, Sonntaga, Kavvadab and Friedlc (2017) universities have implemented GCI with aim to provide solutions to reduce climate change. In as much as South African universities also adopted a GCI in early 2011 it is not known at what extent they had responded to these global concerns. Bulunga and Thondhlana (2018) revealed that issues of environmental sustainability and climate

change concerns occupies center-stage of our country, and it is alarming through persistent load shedding and limited water supply in South Africa. According to Ntoyakhe (2018) Minister Nzimande continuously called collages, and universities to exercise leadership in inventing up-to-date and relevant solutions to attain climate change free communities. The authors also suggested that to be informed on how the universities have been responding to the climate change tragedy, it is necessary to determine what are the initiatives they have deployed to mitigate the problem. Also, some authors have stated that there are frequent complaints about overusing of water, electricity, and campus natural environment in universities.

The literature indicates that the is no recent studies that has been conducted specifically concerning GCI effort on eradicating environmental and resources abuse in the universities. Green campus initiative is quite new and research in the field is still significantly undersized (Ntoyakhe 2018). Given the criticality of environmental sustainability this study seeks to fill this knowledge gap by determining the conservation standing at DUT. The study connects to SDG 13th to 'Take urgent action to combat climate change and its impacts', investigating the role that DUT has played since 2012:14) the challenges and future plans.

1.5 RESEARCH AIM

According to Singh (2018: 32) a research aim is the purpose and envisage outcome of the study that directs and controls the actions of the researcher. Just like a vision, a research aim is future oriented and forward looking, it is a statement of the purpose of a study. The aim of this study is to determine the role of GCI as an integral part of environmental sustainability platform and efficient resource use at DUT. In order to fulfill this aim, the study was guided by the following research objectives and questions:

1.5.1 Research Objectives

Research objectives are defined as clear, concise, declarative statement articulated in the present tense (Singh 2018:44). These objectives would assist to give focus to the study. These research objectives were instrumental in determining the literature to read and kind of data to collect (Pathmanathan and Brownlee 2003). The fundamental objectives of the study were:

- To determine the level of understanding of GCI among selected permanent academic staff members and students across the campuses of DUT.
- To assess the progress on the Green Campus Initiative Programs.
- To examine the impact that the GCI has had at DUT.
- To determine the challenges of implementing GCI at the DUT.
- To investigate mechanisms of promoting GCI at DUT.

1.5.2 Research Questions

Research questions are questions that your research project sets out to answer (Hayne 2006). The question in this study sought to identify the conservation status of Durban University of Technology and future relevant strategies.

- What is the level of understanding of GCI among selected permanent academic staff members and students across the campuses of DUT?
- What Green Campus Initiatives have been achieved at DUT?
- What has been the impact of GCI at DUT?
- What are the challenges facing the university in implementing GCI?
- What are the mechanisms that can be put in place to promote GCI at the DUT?

1.6 SETTING OF THE STUDY

DUT is a medium size university with approximately 33 000 students spread across its seven campuses. Five Campuses are based in Durban that include Stive Biko Campus, ML Sultan Campus, Ritson Campus, City Campus, Brickfield Campus and two Pietermaritzburg based Campuses include Indumiso Campus and Riverside Campus.

(Figure 1-2) located in the Durban metropolis and around the city of Pietermaritzburg in KwaZulu Natal. DUT is a member of the Association of College and University Housing Officers International Southern Africa Chapter (ACUHO-I-SAC) aimed at environmental action and education in university residences (Connect@Mandela, 2017). Figure 1-1 shows map of Durban and Pietermaritzburg where DUT campuses are located.

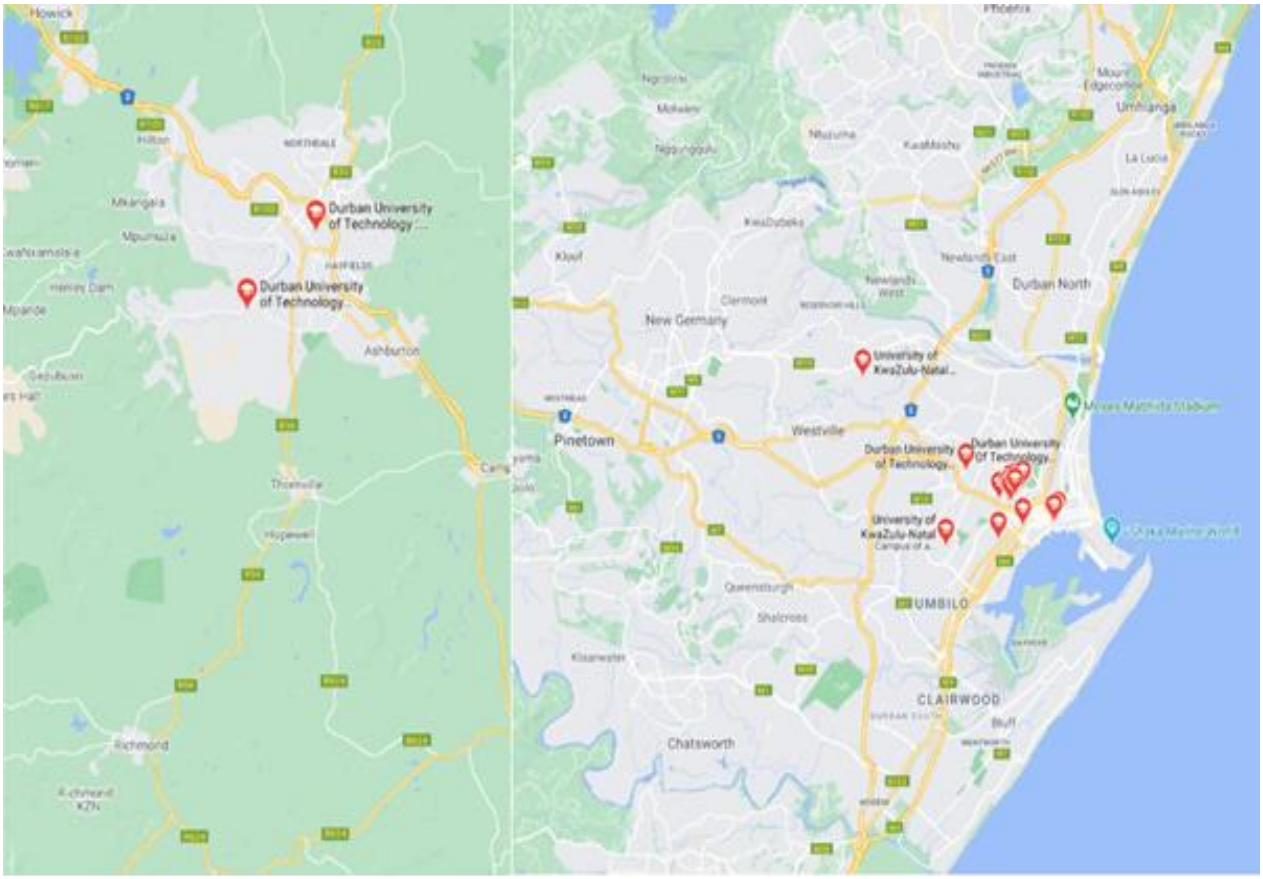


Figure 1-1: Map of Durban and Pietermaritzburg showing location of DUT campuses
Source: Google Maps (2020)

The main campus of DUT is Steve Biko where the Vice Chancellor and Deputy Vice Chancellors are housed. According to DUT GCI (2020) the mission of DUT-GCI is multifold including:

- creating a platform for dialogue on environmental sustainability and climate change,
- raising awareness and build capacity on environmentally sustainable practices,

- influencing values and beliefs leading to behavioral change towards their environments of practice,
- conducting research and design context specific intervention strategies that addresses climate change challenges,
- influencing, developing, and monitoring policy on environmental sustainability,
- creating, supporting, and advancing environmentally sustainable practices, and
- identifying and fostering strategic partnerships with key stakeholders towards the promotion of environmental sustainability.

1.6.1 Delimitation of the study

The delimitations are defined as boundaries in the researcher's control that outlines the capacity, boundaries, limits, and margins of a study (Simon 2011).

- The study sample population selected for this study is DUT campuses both Durban and Pietermaritzburg located in KwaZulu Natal.
- The study sample population was limited to registered students who are GCI members, DUT Residence Life Officers of both Durban and Pietermaritzburg Campuses and the Green Campus Initiative Officers, not other sources; this means the study is not exhaustive.
- The study was limited only to student housing department, GCI offices not on the institution as a whole.
- The findings therefore apply to GCI offices within the context of Durban University of Technology.

Figure 1-2(a): ML Sultan Campus

Figure 1-2(b): Part of Steve Biko Campus (under construction)

Figure 1-2(c): Ritson Campus

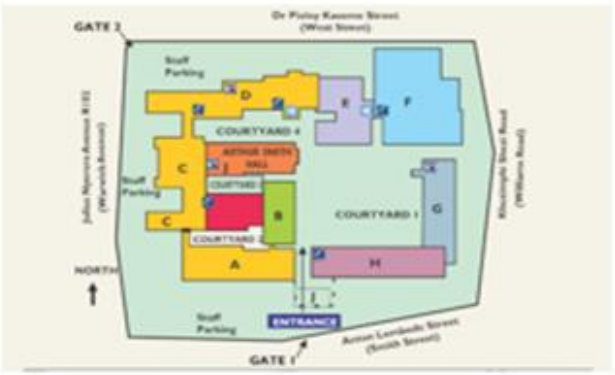


Figure 1-2(d): City Campus

Figure 1-2(e): Brickfield Campus

Figure 1-2(f): Riverside Campus

Figure 1-2(g): part of Indumiso Campus

Source: https://www.dut.ac.za/maps/

1.7 CONCEPTUAL FRAMEWORK

According to Swaen, Demoulin and Pawels-Delassus (2020) a conceptual framework illustrates what the research hopes to establish through the identification of variables and mapping out causal relationships between such variables. According to Glatthorn (1998); Leshem and Trafford (2008); Miles and Huberman (1884) are reflections of concepts that present the signposts to the current version of a complex phenomenon that is being studied. The title of the dissertation is the role of Green Campus Initiative (GCI) as integral part of environmental and sustainable resources utilisation: A case study of Durban University of Technology.

The concepts that follow emanate from the title and warrant definition to illustrate how they link with each other to develop the conceptual framework which informed the literature reviewed as well as the theories used in the study.

1.7.1 Green campus

Humblet, Owens and Roy (2010) define a green campus as a campus of higher education where environmentally friendly practices and education combine to promote sustainable and eco-friendly practices to improve energy and water efficiency. A campus where environmental culture is redefined, and new paradigms are developed by creating sustainable solutions to environmental, social, and economic needs.

1.7.2 Green Campus Initiative

Green Campus Initiatives is defined as a programme that aim for the promotion of environmental sustainability interventions. It is underpinned by the belief that universities will exercise leadership within their premises and broader regional society by modeling ways to minimize global warming emissions, and by providing the knowledge and the educated graduates to achieve carbon neutrality (Regreen UWC 2018).

1.7.3 Environmental sustainability

Arora, Fatima and Verma (2018) regards environmental sustainability as a necessity for survival on the earth faced with escalating anthropogenic activities that do not only over-exploit, but also contaminate and degrade environmental resources. Morelli (2011: 1)

defines environmental sustainability as ‘the maintenance of natural capital’, connected to both social and economic sustainability. GCI aims to promote environmental sustainability and develop climate change interventions at university campus level.

1.7.4 Sustainable resource utilisation

According to the World Commission on Environment and Development (WCED) (1987) sustainability is the ability to meet the needs of the present while living within the carrying capacity of supporting ecosystems and without compromising the ability of the future generations to meet their own needs. The United Nations (2020) regards sustainable resource utilisation as sustainable production and consumption, which promotes doing more and better with less, increasing resource efficiency, promoting thrifty lifestyles, and decoupling economic growth from environmental degradation.

Goni, Shukor, Mukhtar and Sahran (2015)**;** Mafongosi et al. (2018) associate the concept of sustainability with three triple interlocking goals of social, environmental and economic prosperity, while Aasa et al. (2020:82) link sustainable resource utilisation to the ‘principle of intergenerational equity’. According to the Association for Promoting Sustainability in Campuses & Communities (APSCC) (2015) GCI is a cooperative movement aimed at initiating and promoting sustainable solutions at grassroots level to sustain ecological/environmental, economic, social and cultural resources.

1.8 RESEARCH STRUCTURE

This study is structured in an academically accepted way, starting with the orientation to the study, followed by the literature review and theoretical framework, research methodology, data presentation, analysis and interpretation and ends with conclusion and recommendations. The following structure is used to present the research report:

Chapter 1: Introduction and orientation to the study

This chapter was aimed at introducing and orientating the reader to the study by explaining the background, rationale for the study, research problem and outlining the research aim, questions, and objectives. In this chapter the researcher explores the

significance of the study and the contribution that the study makes to knowledge in the field.

Chapter 2: Literature review and theoretical framework

To Show awareness of currently existing studies, the theoretical framework and literature review section of a dissertation is of vital importance because it enables the researcher to explain how things connect and also locate contradictions and gaps in the main concepts of the phenomenon under investigation.

Chapter 3: Research methodology

This chapter present the researcher paradigm, research methodology, research design and related data collection tools, and analysis techniques. This chapter is important as it introduces the researcher genre, character, and tone, and it is also used to justify the choice made of methodology. The researcher uses this chapter to expound the research design, explain the tools that will used to collect primary and secondary data as well as the reasons why the tools were deemed the most appropriate to best answer the research questions.

Chapter 4: Data presentation, analysis and interpretation

Qualitative and quantitative data are presented, analysed, and interpreted in this chapter. This chapter lays the foundation for all the recommendations and conclusion in the final chapter.

Chapter 5: Recommendations and conclusion

This is the final chapter of the research report. Conclusions will be drawn from the discussion of findings in chapter four and literature as reviewed in chapter 2. After comparing literature and findings in chapter four, gaps will be identified, and recommendations advanced. This chapter will also be used to identify areas for future research in the field of GCI.

1.9 CONCLUSION

Understanding the background of the phenomenon and the problem under investigation assist in understanding the path that the investigation will take (Nilsson 2011). In this chapter the research problem was conceptualised, and insight given into the rationale, aim, research objectives of the study. In this chapter the researcher mapped out the conceptual framework to contextualize the study. This chapter also gave a detailed outlined as well as contents of chapters to come. In the next chapter the researcher allows the experts in the relevant fields of environmental and resource sustainability and GCI as hinted in the conceptual framework to enrich the study through the provision of conceptual theoretical arguments. In chapter 2 the researcher also introduces the theories that underpin the study.

CHAPTER 2

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 INTRODUCTION

The previous chapter provided an orientation to the study. The research aim was identified, and the research problem was offered together with the research objectives. This chapter will provide information on conservation in higher institutions of learning in a form of relevant literature review underpinning the study. Environmental protection and green initiatives have attracted great attention from both the society and the universities globally. Tezel, Ugural and Giritli (2018) state that green campus as a concept includes minimisation of negative environmental impacts, generation of public awareness about sustainability as well as teaching and research functions of higher education institutions.

Literature connecting to Green Campus Initiative is quite new and research in the field is still significantly undersized (Ntoyakhe 2018) even though the study of campus conservation has been debated in summits for years (Mafongosi, Awuzie and Talukhaba 2019). Higher education is experiencing a rapid development and growth in terms of student numbers and infrastructure, with the sharp increase of energy use and the low level of campus operation efficiencies (Tan, Chen, Shi and Wang 2014; Tiyarattanachai and Hollmann 2016).

Yanthi, Yunansah, Wahyuningsih and Milama (2018) argue that all campus activities consume huge amounts of energy and resources and generate a lot of waste. In agreement, Bukhary, Batista and Ahmad (2019) point out that colleges and universities in the United States spend an average of $1.10 per square foot on electricity and on natural gas annually. In a typical college or university classroom building, lighting

represents 31 percent and space heating accounts for 28 percent of total energy use. Marinho, Gonçalves and Kiperstok (2013) posit that universities are required to undertake a leadership role towards sustainable development and energy efficiency, which according to Bulunga and Thondhlana (2018) run into millions of US dollars annually. GCI as a movement provides a platform for universities, their leaders, lecturers, researchers and undergraduate students to engage their resources in responding to the challenges of balancing between the human economic and technological development with environmental preservation (Tiyarattanachai and Hollmann 2016).

APSCC (2015) states that among others the GCI movement is aimed at increasing awareness of environmentally sustainable development, create institutional culture of sustainability, educate environmentally responsible citizenry and maintain the movement. The literature reviewed were selected because of their relevance to the issue addressed by the study and the theories selected emanated from literature as naturally twining with the issue of GCI.

2.2 LITERATURE REVIEW

Literature review is described by Pautasso (2013) as a summary of recent literary work that leads to new insights in a field of study. This chapter is crucial because it locates the study within the field and highlights pertinent debates that have been obtaining in the field. The foundation of this study is environmental sustainability with specific reference to the role played by universities and institutions of higher learning in reducing the anthropogenic impacts on the natural environment through research and behavioral change.

The green campus development can be traced back to 1990s, and it took nearly two decades from the beginning of green school advocacy, through the energy and resource efficient campus development to the current green campus development (Tan, Chen, Shi and Wang, 2013). This chapter starts by presenting literature on the rationale for

environmental sustainability and GCI and then presents two relevant theories buttress the study.

2.2.1 Environmental and sustainable resources utilisation

Holzbaur, Jordaan and Wenzel (2013) also argue that achieving sustainability is indeed a complex challenge caused by population explosion and facilitated development intensifying environmental overexploitation (Tiyarattanachai and Hollmann 2016). Aleixo, Leal and Azeiteiro (2018) associate sustainability with the "preservation and conservation of resources for future generations", while Tiyarattanachai and Hollmann (2016) view sustainability as the balance of economic, social, and environmental conditions in development efforts.

Holzbaur et al. (2013) affirm in their study of models of implementing sustainable development into the university, that the notion of sustainability goes back to the Brundtland Report (World Commission on Environment and Development 1987) which defined sustainability in terms of the three pillars (environment, society, and economy). Weenen (2000) argues that the limit of non-renewable resources should be considered by people equipped with the understanding of the relationship between energy use, climate and resultant negative impacts of reckless consumption and overexploitation and other unsustainable practices (Thomashow and Cortese 2014).

Fayiga, Ipinmoroti and Chirenje (2017) concur with Tiyarattanachai and Hollmann when stating that the United Nations proposal of sustainability is not fully adopted by nationalities. Bulunga and Thondhlana (2018) on their study of Action for increasing energy-saving behaviour in student residences, mentioned that human behaviour around resource consumption is at the midpoint of nearly all global environmental challenges, comprising climate change and global warming.

World Commission on Environment and Development (WCED 1987: 46) defines sustainability development as "the ability to meet the needs of the present while living

within the carrying capacity of supporting ecosystems and without compromising the ability of the future generations to meet their own needs". The sustainable development is the kind of development that could be achieved when people live according to the planned behaviour that contribute words the delicate use of resources. The Sustainable Consumption concept also play a pivotal role in contributing to the attainment of sustainable development goals.

This concept refers to the use of goods and services that respond to basic needs to bring a better quality of life while minimizing the use of natural resources and toxic materials as well as emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardize the needs of future generations (Tung Ha, Tran, Nguyen and Hoang 2019). Tung Ha et al. (2019) further point out that that sustainable consumption must be widely understood, incorporated into the activities and everyday people practices like the reduction of water, materials and energy consumption, active participation in recycling, support for environment-friendly companies and the economy of resources.

Amaral, Martins and Gouveia (2015) aver by proclaiming that resources unavailability is not a problem as human beings have the ability to adapt and innovate new way of living. Genta, Favaro, Sonetti, Barioglio and Lombardi (2019) concur when they suggest that one of the solutions used cease the exploitation of resources is teaching people the strategies to save. Tiyarattanachai and Hollmann (2016) further point out that the consumption of resources precisely energy and water by the students is four times greater than a regular resident. Fischetti (2013) is of the view that the entire world could get all of its energy from wind, water and solar sources by 2030, which could be facilitated by education, research and resultant innovation.

The Stockholm Declaration of 1972 addressed the Sustainability in Higher Education. According to Tiyarattanachai and Hollmann (2016) the declaration focused on finding ways in which universities, their leaders, lecturers, researchers, and students can engage their resources in responding to the challenges of balancing between the human quest for economic and technological development with environmental preservation.

The sustainability agenda does not solely belong to UN but to Governments and citizens (Hopkins, 2016). Govender mentioned on the Eskom report (Water and Energy 2014) that sustainability means everyone, and every sector in the industries must have enforce measures that will minimise wasting resources. He further outlined their contributions to water and energy conservation as Eskom that they achieve their saving objectives through innovation, in the sense that they are avoiding harm to the natural environment; reducing freshwater usage; eliminating liquid effluent discharges through effective water management processes and the re-use of mine-water; and minimising the impact of its activities on groundwater resources.

What the industries are doing is inclined with the triple bottom line theory whereby they take responsibility to reduce environmental negative impact, maximising of economic activities and enhancing social justice.

2.2.1.1 Worldwide environmental problems

According to Bulunga and Thondhlana (2018) there is a unanimous agreement that human behaviour around resource consumption is at the center of most global environmental problems, including global warming and climate change. Monroe, Bode and Megalos (2015) argue that unfamiliar weather, high petroleum cost, coastal surges and erosion and terrible wildfires are indicative of the many negative impacts of climate change. Jafari (2013) attests that climate change is caused primarily by a build-up of 'greenhouse gases' (CFC gases) released by human activities, for instance the burning of fossil fuels, deforestation and particular forms of agriculture.

Climate change and its consequences is regarded as the foremost challenge facing the earth in modern times (Friedrich and Kretzinger 2012). Tung Ha, Tran, Nguyen and Hoang (2019) hinted that CFC gases are typical of after-effects of the increasing world's population, economic growth and increase in pollution, production and consumption, and point out the continuous resource depletion and environmental deterioration. The United

Nations (2017) state that the effect on human is revealed through poverty and environmental degradation which are closely interrelated.

According to Glazewski and Esterhuyse (2016) the situation globally is getting worse not very long ago the increasing deterioration in environmental quality in the southern African region has been observed. Jafari (2013) postulates that developing countries are particularly vulnerable to effect of climate change, while being least able to afford the cost of adapting to it. Fayiga et al. (2017) aver that the regions and Africa as a whole are overwhelmed by the environmental problems that are reflected indirectly in the regional Southern African Development Community (SADC). Tung Ha (2019) confirmed that consumption patterns are extremely high in particular areas of the world and the basic human needs are now being not met.

Baker-Shelley, Van Zeijl-Rozema and Martens (2017) argue that high institutions of learning are key stakeholders in driving society's quest for sustainable development. To this end, Genta et al. (2019) state that there are several international declarations that are signed by Higher Education Institutions which shows the breadth of the commitment universities have towards resources sustainability by offering good environmental education and research occasions. According to Zhao and Zou (2015) universities include good environmental practices in all courses, expand environmental issues in society as a whole and champion the move towards sustainability is key for building a sustainable future Tung Ha et al. (2019). This can be achieved through proper education, research, and involvement of all university and local community stakeholders (Dumitriu 2017).

2.2.1.2 A sustainable university

Tan, Chen, Shi and Wang (2013) assert that in order to make the energy and resource efficient campus development smoothly, a strong university-level leadership and coordination organization need to be established. It is important that business decisions are guided in the direction of enhanced environmental outcomes corporate coverage frameworks in order to increase scientifically informed standards that without fail consider land use and land conversion, clean air availability and quality of freshwater, degradation

of coastal and marine habitats and sustainable use of renewable resources (Kareiva, Groves and Marvier 2014).

The firm frameworks should be inclined with Sustainable Development Goals (SDGs) which mark an important and effective method of global mobilisation to achieve a set of important social priorities worldwide amongst those goals; the promotion of global awareness on sustainable consumption and protection, energy, climate, environmental degradation are the world priorities that this study speaks to (Weber 2017). A good top-level design is also important for the construction and operation of energy and resource efficient campus. Choi, Oh, Kang and Lutzenhiser (2017) argue that university infrastructures are usually embodied on a university campus, which are significantly large systems containing lecture classes, restaurants, sports halls, student residences, laundry, laboratories and more.

Thomashow and Certes (2014) are of the view that the reason for this is that energy is tangibly connected to politics, economics, and national security.

Alam (2018); Bulunga and Thondhlana (2018) mention that the core activities of the university are to impart knowledge, develop knowledge through research, contribute to the sustainable development agenda of the local, provincial and national governments.

Table 2-1: Talloires Declaration

The Talloires Declaration		
1	**Increase awareness of environmentally sustainable developments**	Use every opportunity to raise public, government, industry, foundation, and university awareness by publicly addressing the urgent need to move toward an environmentally sustainable future
2	**Create a culture of sustainability on Campus**	Encourage all universities to engage in education, research, policy formation, and information exchange on population, environment, and development to move toward a sustainable future
3	**Educate students for 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 responsible citizens
4	**Foster environmental literacy**	Create programs to develop the capability of university faculty to teach environmental literacy to all undergraduate, graduate, and professional school students
5	**Practice ecology at institutions**	Set an example of environmental responsibility by establishing institutional ecology policies and practices of resource conservation, recycling, waste reduction, and environmentally sound operations
6	**Collaborate between disciplines**	Encourage the involvement of government (at all levels), foundations, and industry in supporting university research, education, policy formation, and information exchange in environmentally sustainable

		development. Expand work with nongovernmental organizations to assist in finding solutions to environmental problems
7	**Involve all campus stakeholders**	Convene school deans and environmental practitioners to develop research, policy, information exchange programs, and curricula for an environmentally sustainable future
8	**Enhance capacity at K-12 schools**	Establish partnerships with primary and secondary schools to help develop the capability of their faculty to teach about population, environment, and sustainable development issues
9	**Increase outreach across the nation and the World**	Work with the UN Conference on Environmental and Development, the UN Environment Program, and other national and international organizations to promote a worldwide university effort toward a sustainable future
10	**Maintain the movement**	Establish a steering committee and a secretariat to continue this momentum and inform and support each other's efforts in carrying out this declaration (Report and Declaration of the Presidents Conference, 1990)

Source: Alam (2018)

According to UNESCO, education can be beneficiary to society in a multiple number of ways. Education makes people wiser more knowledgeable, better informed, ethical, responsible, more accountable and pro-environmental. Mtutu and Thondhlana (2016: 4) argues that pro-environmental university behaviour is any “behaviour that consciously seeks to minimise the negative impacts of its actions on the natural and built environment” through the application of conservation notions in its premises, encouraging and promoting the concept of sustainability on their premises. Don (2017) adds that a sustainable university refers to environmental, economic and social concerns that a university attaches to its activities, that minimize negative environmental, economic, social and health effects generated by the use of their resources (Amaral and Martins 2015).

University leaders and researchers in the field of environmental sustainability should appreciate the fact that if the degradation of the environment continues, it will destabilize their economic success and that of their local environment (Alam 2018). With the signing of the Talloires Declaration in 1990, a significant improvement was made in the level of awareness of colleges and universities to have a positive contribution on the way toward environmental improvements (Clugston and Calder 1999). Often, universities are criticized for making commitments to sustainability with few actions (Alam 2018). Table 2-1 illustrates 10 actions required from the parties to the Talloires Declaration.

The Talloires Declaration of 1990 serves as a blueprint for the promotion of environmental sustainability among universities and their spheres of influence. It is in this spirit that the GCI was conceptualised in 2011 by COP 17 held in Durban, South Africa and formally instituted across universities in South Africa by Dr Blade Nzimande (then National Minister of Higher Education) in 2012 as a framework for students to play their part in the sustainability efforts and also realise business opportunities that could arise from the solutions they come up with (Moodley 2012; Brand South Africa 2012).

2.2.1.3 Environmental education

Mason, Brooking, Oberender, Harford and Horsley (2003) disclose that education for sustainability first appeared on the international agenda at the Stockholm Conference on the Human Environment in 1992. Environmental education as one of the pillars of sustainable development, contributes to the fundamental understanding of the relationship and interaction between mankind and the whole environment and promotes public environmental ethics regarding the ecological balance and quality of life, awakening, in individuals and organized social groups, the desire to participate in the construction of their citizenship (Rauen, Lezana and da Silva 2015).

The intention of environmental education is to make individuals cleverer, more well-informed, better knowledgeable, principled, accountable, critical and capable of continuing to learn, raise awareness and provide knowledge to shift of attitudinal behavioral aspects and planned behaviour towards environment and its sustainability (Misbahul, Lilia, Subahan and Muhammad 2013), which Sorrell (2015) views as the cheapest alternative for a sustainable future. Environmental education also serves society by providing critical reflection on the world, especially its failings and injustices, and by promoting greater consciousness and awareness, exploring new visions and concepts, and inventing new techniques and tools (Weenen 2000).

The individuals with better levels of education are capable of holding pro-environmental attitudes and have a greater sense of efficacy that facilitates their participation in sustainability movements (Tung Ha, 2019), which should be used to bring climate and energy literacy to the attention of people (Hartman 2016) as a plan to influence

behavioural changes. LaMorte (2019) instigated that the Theory of Planned Behavior is a close link and serves as a background of environmental education as affirms the possibilities of altering human behaviour on the basis of intention to adopt certain behaviour. Kollmuss and Agyeman (2002) suggest that only pro-environmental behaviour is a behavior that can cease exploitation of resources and nature by individuals and organisations.

Bartniczak (2015) claims that one of the factors to determine the quality of life of residents in a given territory is the state of the environment and environmental infrastructure. Biodiversity is progressively more recognised as one of the foundations of health ecosystems. The loss of biodiversity owing to individual actions that lead to climate change has the prospective to decrease multi-trophic level interactions (Laurila-Pant et al. 2015). A healthy environment supports life by providing clean water, fresh air, fertile soils, flora and fauna that we need to conserve (Strydom and King 2013).

United States Environmental Protection Agency (2019) postulate that environmental education is steered through the interaction of its components. These components collectively do not promote a particular viewpoint rather than drag individuals to extent where they are able to weigh various sides of an issue through serious thinking and it enhances their own problem-solving and decision-making skills.

Bowers and Phukani (2018) argue that the ultimate goal of environmental education is to create a concern and awareness among world population about the overall environment and its associated problems. Environmental literacy is also announced as part of environmental education which consist of five elements namely: awareness, knowledge, attitude, behaviour, and environmental involvement as illustrated in Figure 2-1.

Figure 2-1: Components of environmental education
Adopted on: Bowers and Phukani (2018)

Misbahul, Halim, Meeran and Fairuz (2013) added that the execution of environmental education is to create people who are capable of evaluating and display their concern in respect of sustainable development. According to Mondel (2014) the goals of environmental education are to improve the quality of environment, create awareness among the people on environmental problems and conversation and to enable people to participate in decision-making and develop the capacities to evaluate the developmental programs.

2.2.2 The role of Green Campus Initiative (GCI)

According to Filho, Shiel, do Paço and Brandli (2015) GCI is an attempt by universities and their campuses to continue their education activities regarding environmental sustainability and their influence on societies through their actions. The GCIs is a broad impression, which cover the administration of campus sustainability operations (Aleixo et al. 2018). GCIs include the design of campuses for energy efficiency, management of green buildings, energy, water, food, transportation, purchasing, waste, and sustainable landscaping (Rwelamila and Purushottam 2015).

GCIs aim to harmonise and balance universities and their campuses, core and peripheral operations, people, and nature to ensure that the Talloires Declaration and other frameworks of sustainability are implemented. Filho, Will, Salvia, Adombent, Grahl and

Spira (2019) aver that GCI is the university conservation platform frequently controlled by students that empowers them and staff to implant sustainability in the curriculum, operations, communities, and governance to change university stakeholders' materialistic consumption patterns and lifestyles, motivated by a growing awareness of the impact of their behaviour on the environment (Kristina and Matea 2016).

All these efforts are geared towards decreasing the carbon footprint of campuses (Teah, Yang and Onuki 2019). Teah et al. (2019) also suggest that GCIs by Tokyo's universities spill over to selected local communities' green initiatives to spearhead sustainable production and consumption efforts. Yanthi et al. (2018); Alghamdi, Heijer and Jonge (2017) declared that green campus cannot be separated to the concept of sustainable development.

Acuho-I (2019) expect GCI to take charge in reducing consumption rate of water and electricity and protect environment within university and surrounding communities. According to Bull, Romanowicz, Jennings, Laskari, Stuart and Everitt (2018) Green Campus Initiative covers such traits as ethical investment, energy sources, waste and recycling and carbon reduction, hence Tangwanichagapong, Nitivattananon, Mohanty and Visvanthan (2017) postulate that GCI was established with an aim of promotion of campus environmental and resources sustainability interventions. GCI is seen as a response to the sustainability stipulations of the United Nations and its expectation to see universities at forefront in implementing sustainability initiatives (Yuan and Zuo 2013).

James and Card (2016) discovered and shared that there was still reluctance on the part of many universities management to make environmental issues a priority in curricula, research, service, and operations. In agreement Pantaleo, Rwelamila and Purushottam (2015) declare that GCI is not fully implemented and still has a long way to go in order to reach its full potential of transformation. To reach a level of a fully environmentally friendly institution there are lot of stages to embark and accomplish. GCI established greening indicators on campus such as electricity management audit, water management audit, landscape management audit, biodiversity management audit, waste management audit and building management (Don 2017). These indicators are utilised to determine the

extent of sustainability achieved as results of GCI implementation in a particular university.

GCI is underpinned by the belief that people behavior should be altered to exercise leadership within university community and broader regional society by modeling ways to minimize environmental problems. Bull et al. (2018) postulate that in other countries such as Canada, Green Campus Initiative is known as Campus Climate Initiatives and in European universities is known as Green League aimed at inventing and investing novel curricula that hearten students to generate positive change and gain irreplaceable skills in the environmental field. GCI is lasting driver of sustainable development within the higher institutions of learning, as it addresses the Triple Bottom Line approach to development (Roberts and Cohen 2002).

2.2.2.1 Stakeholders to GCIs

Arroyo (2017) observed that GCI consist of several stakeholders, as itemized in Table 2-2. Each of the stakeholders listed in Table 2-2 has an essential role to play in the achievement of a green campus. Mafongosi (2018) points out that for GCIs to be implemented successfully the perceptions of stakeholders are taken to consideration. Katiliūtė, Stankevičiūtė and Daunorienė (2017) raised that stakeholders' participation plays a massive role in the execution of GCIs and the GCIs cannot be implemented in silos.

According to Filho et al. (2019) Green Campus Initiative has office model which serve as skeleton to establish smooth campus sustainability. Based on this model GCI act as a node, where all conservation associated initiatives are organised. In this model it is depicted that there is wide range of organizations that should get along towards the carrying the responsibilities that include policy making and project executive to attain sustainability (Filho et al. (2019).

Table 2-2: Green campus stakeholders

External stakeholders	**Internal stakeholders**

- **Community/donors**
- **NGOs**
- **University bodies**
- **Companies**
- **Other universities**
- **HE associations**
- **Alumni**
- **Government**

- Sustainability officer
- Faculty
- Staff
- Research centres
- Administration
- Students

Adopted from Arroyo (2017)

The green office principles emphasise the mandate given to the office by the strategic plan of the university as it is expected that greening the university is one of the perspectives. GCIs should be student-driven, and the students involved should receive adequate training and support from the university. The green office cannot operate effectively without dedicated resources. Adomßent, Grahl and Spira (2019) highlight the importance of integration of all GCIs to avoid silo operations and efforts. Collaboration with teaching, learning, research, and other university initiatives is crucial.

Figure 2-2 illustrates that GCIs cannot succeed if the GCO (Green Campus Office) is expected to operate as an entity separate from the rest of the university operations. GCIs should be a strategic concern enshrined in the university's master strategic plan and supported by the executive leadership of the university.

Figure 2-2: Green Office Principles
Source: Adomßent et al. (2019)

2.2.2.2 *The process of implementing GCIs*

According to Rwelamila and Purushottam (2015) it is not feasible to translate s a university into green campus by procedure alone. This will require deliberate wide range processes, practices and personnel competencies with roles and responsibilities and reporting lines to facilitate communication and interaction between academics and non-academic personnel.

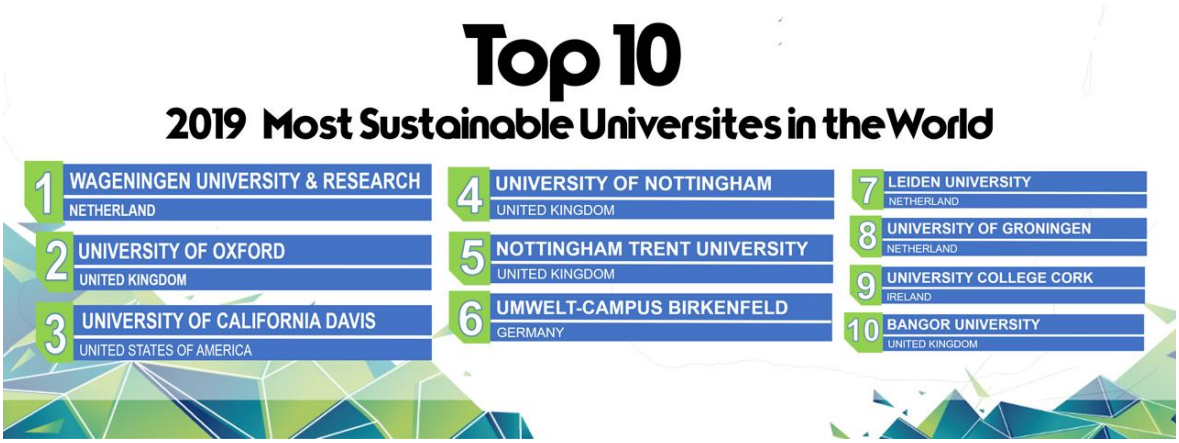


Figure 2-3: Green Metric
Source: Greenmetric UI (2019)

Too and Bajracharya (2015) state that sustainability policies at universities that guide the actions of the GCO are important. The sustainability status of the universities is measured by means of Green Metric, which is a metric for world universities ranking this metric include various sustainability categories which used to allocate scores (Study International Staff 2019). This metric creates rankings of universities from the greenest to the least green based on performance on six categories, green statistics, energy and climate change, waste management, water usage, transportation and education. Clearly, GCIs encompass much more than a single office acting in isolation can achieve.

Figure 2-3 illustrates the top 10 most sustainable universities globally. Don (2017) views the ranking of green universities as reaffirmation global universities of their commitment to matters of sustainability. The aim of the metric is encouraging universities in the world

to look and self asses their policies and direction in relation with the effort to combat global climate change by joining the green university movement. Furthermore, the metric provides the outcome of online evaluation concerning the present condition and policies linked to Green Campus and sustainability, in the universities globally (UI GreenMetric 2015). The Green Metrix has the following indicators used for the ranking of universities and they have their particular weightings are:

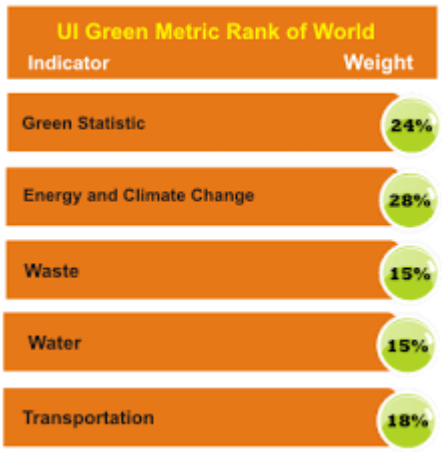


Figure 2-4: Green Metrix
Source: GreenMetric (2016)

According to Kermit and William (2019) GCIs have an obligation to make universities operate in a manner that is ecologically, social, and economically sound. Kermit and William (2019) add that in order to accomplish this the university needs to operate in a sustainable manner considering all three when making decisions. Universities are required to contribute in regional, national, and worldwide effort to combat climate change in a number of ways. GCI should in include in their plans actions to educate, lower emissions reduce dependence on fossil fuels, minimise cost for energy and maintenance.

2.2.3 The impact of the GCIs

The GCIs work being done by a number of universities in reducing the exploitation of resources and environment has gained the attention of the United Nations (Li, Tan and Rackes, 2015). According to Alberts, Gurguc, Koutroumpis, Martin and Muulsand Napp

(2016) universities offer an appealing proposition as they have a major carbon footprint split across their direct and indirect emissions. GCI has influenced number of universities including Tokyo university to use renewable energy sources such as solar photovoltaic (PV) power as a potential solution for reducing the carbon footprint without compromising the functionality of campuses (Teah et al. 2019).

According to Hani, Osama, Mohamad, Raed and Muna (2019) the UN has taken an initiative to form partnership with other United Nations agencies, where together they established United Nations Environment Program (UNEP). The UNEP was influenced by universities to launch an initiative termed Global Universities Partnership on Environment and Sustainability (GUPES) to promote the integration of environment and sustainability concerns into teaching, research and community engagement (Hani, Osama, Mohamad, Raed and Muna 2019). Li, Tan and Rackes (2015) point out that the GUPES initiative has encouraged universities to take responsibility in diminishing aspects that are contributing to global warming.

United Nations (2017) observes that universities around the world are trying to integrate sustainability concepts into their policy, organization and activities. The GUPES provide a platform for universities to share with one another the initiatives they deploy to save the environment, water and energy. This has encouraged universities to observe their consumption of energy in laboratory activities, including the operation of super computers. Teah et al. (2019) argue that the University of Tokyo through its sustainable campus project plans to cut the campus CO_2 emissions by 50 percent at year 2030. Manzi (2016) state on the article that planting trees can curbs on the greenhouse effect, since carbon dioxide is one of the most common greenhouse gases. One mature tree absorbs approximately 22 kilos (or 48 pounds) of carbon dioxide each year.

GCIs offices have a duty to account at conferences held yearly for the work they do to sustain their campuses. According to Foo (2013) the campus sustainability group implemented the use of bicycles as they are environmentally friendly mode transportation

as it produces no air or noise. Bulunga and Thondhlana (2018) assert that universities apportion massive amounts of their budgets to energy procurement, with energy expenditure reaching up to millions of US dollars annually.

In a study about the energy consumption in universities, Hesa (2014) found that worldwide universities utilized about 7.9 billion kWh of energy and produced 2.3 million tons of carbon. In another study about the sustainable campus for the higher education institutions, Alam (2018) found that issues related to climate change can be partially relieved. Some of the suggestions for sustainable development practices basically necessitate a lower use of fossil fuels, which are not sustainable as major generators of greenhouse gases. Studies by Alberts, Gurguc, Koutroumpis, Martin and Napp (2016); Sintov, Dux, Tran and Orosz (2016) on universities and student residences show that GCIs have accounted for relatively high savings of about 30 percent.

Bulunga and Thondhlana (2018) state that at Sonora University in Mexico, a long-term implementation of an energy saving, and efficiency programme generated considerable power decrease, with savings of up to US $5,840 in a period of three years. Mtutu and Thondhlana (2016) state that the interventions for energy conservation remain suitable because these motivate behavioral adjustments by means of increasing individuals' environmental awareness instead of obligatory regulations that often fail. These arguments make a strong case for the implementation and support of GCIs across universities including the Durban University of Technology and its campuses.

2.2.4 Challenges of implementing Green Campus Initiatives

As stated in chapter 1 and earlier on in this chapter, the GCI was launched in South Africa in 2012 by Dr Blade Nzimande the Minister of Higher Education and Training at the time. While Hani et al. (2019) some researchers contend that all institutions of higher education ought to be entirely changed into green campus, Filho et al. (2017) observe that there are many barriers that prevent GCIs from being fully implemented, with one significant trend being a lack of institutional sustainability policies. Filho *et al*. (2019) speculate that

institutional transformation necessitates arrangements in a multifaceted process to be more receptive and supportive of GCIs. Hani et al. (2019) further regard the creation and implementation techniques of saving energy, reducing water consumption as a single element of GCIs as already discussed.

Mafongosi, Awuzie and Talukhaba (2018) point out that the motives behind the launch was to make the high institutions of learning became conscious of the undesirable environmental impacts that are instigated by their daily processes. Tung Ha, Tra, Nguyen and Hoang (2019) conclude that there are immense challenges involved in promoting sustainable consumption and the practice perspective suggests that moralizing or trying to persuade individuals that curbing consumption would contribute to both environmental improvements and increased well-being has little chance of success.

The GCIs sought to offer students with essential skills and knowledge to address and overcome sustainability matters on their campuses and in their communities, when students initially arrive on campus and in their youth, a majority of them having are leaving home for the first time in their life, and this is, probably, the very first time that they can investigate, discover, and wonder about their own values. They also make new counterparts across universities with similar values and ponder about the lifestyle that they are living. Though, six years later after the introduction of the GCIs, achievement of campus sustainability remains a critical subject that seems to be overlooked.

It is evident in Coleman (2019) article that some universities are dragging their feet when it comes to implementing GCIs as the Sandeep University only started GCIs in 2019. The universities around the planet are not prioritising the assimilation environmental conservation solutions into different levels such as curricula, services, research, and processes. Rwelamila and Purushottam (2015) found that many universities are struggling to fully implement the GCIs. Genta et al. (2018) indicate that there are various reasons that prevent it universities to fully implement GCIs, the most common of which are lack of financial resources, lack of motivation and lack of sustainability policies (Arroyo 2017).

Table 2-3: Implementation of Green Campus Initiative

Impediments to GCI implementation	Mechanisms for successful GCI implementation
• Lack of awareness, interest and involvement • Not having functional organisational structure • Lack of funding • Lack of support from the HEI administrators • Lack of time • Lack of data access • Lack of training • Lack of opportune communication and information • Resistance to change • A profit mentality • Lack of rigorous regulations • Lack of interdisciplinary research • Lack of performance indicators • Lack of policies to promote sustainability on campus • Lack of standard definitions of concepts • Technical problems • Designated workplace • The “machismo”	• Securing support from the management of the HEI • Having effective coordination • Maximising face-to-face communication • Building formal and informal support • Seeking partnership from students and external stakeholders (through also involving the community) • Launching initiatives that attract most of the attention and support from stakeholders • Removing risk and generating organisational support for the running of projects • Having continuity of the launched initiatives • Having the right management framework • Willingness to support low-risk innovation and to mentor staff • Continuously improving the learning curriculum regarding the GCI • Sharing its learning experiences

Source: Mafongosi et al. (2019), Velazquez et al. (2005), Sharp (2002)

Katiliūtė et al. (2017) reported that having a limited budget may result in universities not being able to fully commit to GCI projects as some of these projects require a lot of financial resource for them to be successful. Summer and Marquart-Pyatt (2018) cite an instance retrofitting or construction of new green building buildings and planting of trees.

Katiliūtė et al. (2017) postulate that the lack of awareness and knowledge regarding the GCIs is also one of the impediments that have led to unwillingness among university stakeholders to support the sustainability movement.

Purushottam and Rwelamila (2015) also indicate that the universities have attempted to create green campuses by incorporating environment management system in the university settings. However, these changes remain away from reaching their full potential of systemic transformation. Pantaleo et al. (2015) additionally highlight that the progress of universities in becoming green is influenced by various challenges and barriers and addressing them will facilitate the pace of progress. Rwelamila and Purushottam (2015) cite the need for an effective and efficient green campus management system and the importance of looking at these initiatives as projects to create a conducive environment for green campus projects.

Velazquez et al. (2005) identified 18 impediments to GCI implementation, while Sharp (2002) pointed to mechanisms that can lead to successful achievement of the GCI (Table 2-3). According to Velazquez et al. (2005), there are countless obstructions to successful implementation of the GCIs globally. Based on Table 2-3 the main impediments that were noted were lack of awareness and a lack of financial resources. Mafongosi et al. (2019) state that the lack of financial resources remained identified as a barrier, since GCI projects initiation requires capital, GCI projects relies on sponsors, without funding it is impossible to carry on with the greening plans.

Among the 18 impediments that were identified by Velazquez et al. (2005), Mafongosi et al. (2019) and Sharp (2003), lack of awareness, interest, involvement, support from the High Education Institutions (HEIs) and administrators are the main impediments that lead to unsuccessful implementation of the GCI. Some barriers lie in human behaviour (Bulunga and Thondhlana 2018), human behavioral patterns such as not turning off lights and heaters when leaving rooms and not unplugging electronic appliances constitute unsustainable energy-use practices.

2.2.5 Mechanisms of promoting Green Campus Initiatives

Strong university-level leadership, commitment and coordination organization need to be established for effective GCIs implementation. A number of universities worldwide have been engaged in transforming their campuses to become more sustainability-oriented through GCI. According to Bulunga and Thondhlana (2018) universities are increasingly rethinking approaches and methods to promote efficient and sustainable energy use within their campuses. These following activities divided into different categories were identified by Bull, Joanna Romanowicz, Neil Jennings, Laskari, Stuart and Everitt (2018): Institutional policy and framework, education, research, community outreach, campus operations, assessment and reporting.

2.2.5.1 Green campus programmes

Thiry (2004) contends that programme management is used to coordinate projects which have mutual aim and is the most suitable in evolving situations. Green campus programmes concentrate on prioritizing resources and improving the outcomes and green campus programme management and they are evolving. Rwelamila and Purushottam (2015) concur with Thiry when they suggest that the effective and efficient management of these initiatives require incorporation of project management (PM) principles and thus the need to establish a framework to manage GCIs as projects.

According to Hani et al. (2019) the GCIs are to focus on the creation of educational awareness amongst campus communities about climate change and capacity building on identifying the practical green campus programs that can be initiated at campus level to mitigate the impact of climate change. Cohen et al. (2018) recommend changes to campus infrastructure to include components that will conserve energy and other resources. Human behavior is believed to be potentially a large contributor to environmental problems and over-usage of resources (Fayiga et al. 2017).

The GCI across the universities is actively engaged in teaching and influencing members of the campus community about how individual behaviors contribute to climate change and about the opportunity for making a positive difference collectively. Through various

outreach campaigns and pledges, students are targeting behaviors ranging from waste reduction to energy conservation. According to Don (2017) the global population buys one million single-use plastic bottles, instead of reusable containers. Athena Information Solutions (2019) argues that universities should provide recycling bins, which should be kept in all over the campus, as it would make it easier for students to give materials for recycling. Refilling of pens, paper, cardboard boxes, clothes, plastic items, and others.

Bulunga and Thondhlana (2018) state that energy is a key resource for development, but its consumption has serious financial and environmental repercussions. Levy and Dilwali (2017) announced that universities worldwide spend nearly US$200 billion on operations each year.

Minimising energy usage through planned behavioral changes is widely acclaimed as inexpensive and sustainable pathway towards a sustainable future. With rising fuel and electricity costs, universities are gradually moving to conservation and efficiency measures to save energy and much-needed money (Fonseca 2018). While many campus energy managers have made huge strides in this realm, GCIs often have played a part in helping identify new places to save energy. Allen and Marquart-Pyatt (2018) declares that GCI have assisted universities with energy audits and greenhouse gas inventories and have helped investigate the availability and costs of alternative practices and technologies.

Ferrão and de Matos (2017) reported that the sustainable campus has saving projects, with the development of energy audits and the implementation of low-cost and awareness-raising measures, posted a 15.5 percent reduction on the energy use. In support, Allen and Marquart-Pyatt (2018) point to employee energy conservation behaviors as one strategy to reduce energy consumption. Bull et al. (2018) points out that sustainable universities are using 70 percent solar-based energy and 30 percent from electricity for heating and cooling needs, lighting needs, office machine use, laboratory equipment use.

Some universities implement various water conservation mechanisms throughout their facilities, such as installing low-flow water fixtures, waterless urinals, and mechanised sensors on sinks. While Parker, Sams, Oddar and Manoylov (2017) argue that it is a challenge to keep people interested in water savings, Wanxia and Yonghua (2015) cite the example of Tsinghua, the greenest university in China, which achieved a 30 percent reduction in water usage by adopting new irrigation technology for plant.

According to Barbaglio and Putnam (2009) some campuses use drought-tolerant native plants, use water reclaimed from sewage treatment plants, water captured from capturing showers and sinks, storm water for campus operations, porous pavers to allow rainwater to seep through and infiltrate to the ground water. According to Hani et al. (2019) fitting automatic water regulator systems in student bathing rooms and using water-saving taps the university can save 3,000 tons of water per year. Rasmussen (2011) focuses of careful selection of plants and trees that retain water for landscaping, while Gleik (2010); Wanxia and Yonghua (2015) pay attention to drinking water conservation projects, discouraging the use of single-use water bottles.

Students attend college and university primarily for the coursework, those who live on campus residences spend more time in their living accommodations than they do in classrooms. GCI (2018) argues that the more time spent in residences contribute to increasing consumption rate of electricity and water. Student residences have become learning laboratories for many campus sustainability activities. Normally all it takes is one or two motivated students with a bright idea to get something started. The engagement between students and staff on reducing waste, conservation of resources changes their perspectives towards sustainability (GCI 2018).

Wisecup, Grady, Roth and Stephens (2016) in their study showed that setting common goal and reward for its accomplishment builds a positive competition that results to ethical behaviour. Staddon, Cycil, Goulden, Leygue and Spence (2016) agree with the above authors when showing that the provision and relevant incentives promote change in the

resource's consumption behaviour. Filho et al. (2018) state that many universities across the globe have become gradually more mindful of their effect on the environment and have made considerable efforts to improve their understanding of the conservation dimensions of their operations and the implications and impacts of their activities.

The T-Declaration of 1990 seems to have been a turning point in the attitudes of many universities followed by the formation of the Association for the Advancement of Sustainability in Higher Education founded in 2006. Aashe (2020) asserts that the actions of the association are planned to create sustainable methods the standard inside universities. Genta, Favaro, Sonetti, Barioglio and Lombardi (2018) state that policy alteration in the university sector would help in achieving sustainability by making the ecological footprint relevant and practicable to the decision-making processes on campus.

The Higher Education Sustainability Act that came into law in 2008 initiated donations to universities for the purposes of research programs, curricula, and practices as well as established a national summit to evaluate best practices for sustainability with education staff, federal employees, and business leaders. Rosen, Booker and Merkley (2019) postulate that there was inconsistence on funding as the congress failed to fund the University Sustainability Program since 2010, which interfered with the implementation of sustainability projects in various universities.

According to Grindsted (2011) the overall aim of policies is to enforce sustainability in several spheres of sustainability at Institution of High Education involving research and scholarship, faculty and staff development and rewards, outreach and service, student opportunities, institutional mission, planning, and operations.

Figure 2-5 demonstrates how policy and decision makers can initiate a shift in thinking about sustainability, the value of natural resources and reasons for re-use and recycling. Attaining value from waste plays an important role in talking to future restrictions on resources, and in fostering sustainable growth. It is mentioned that the Rhodes University implemented Environmental Policy, which was amended in September 2015, the policy have successfully regulated the use of energy on campus in order to minimise its carbon

footprint, in line with national and international emission reduction targets (Rhodes University 2015).

Patel and Patel (2012) posit that one of the major problems faced by the world today is the cost associated with the conservation of environment, water, and electricity. This includes dealing with the cost of pollution control, treatment, and environmental protection, which can be considered very expensive where people consider it a burden for development. There is a worldwide misconception that environmental protection comes at the expense of economic development or vice versa. This is not the case if environment protection is achieved through sustainable development. Haggar (2010) asserts that sustainable development promotes economic growth given that this growth does not compromise the management of the environmental resources.

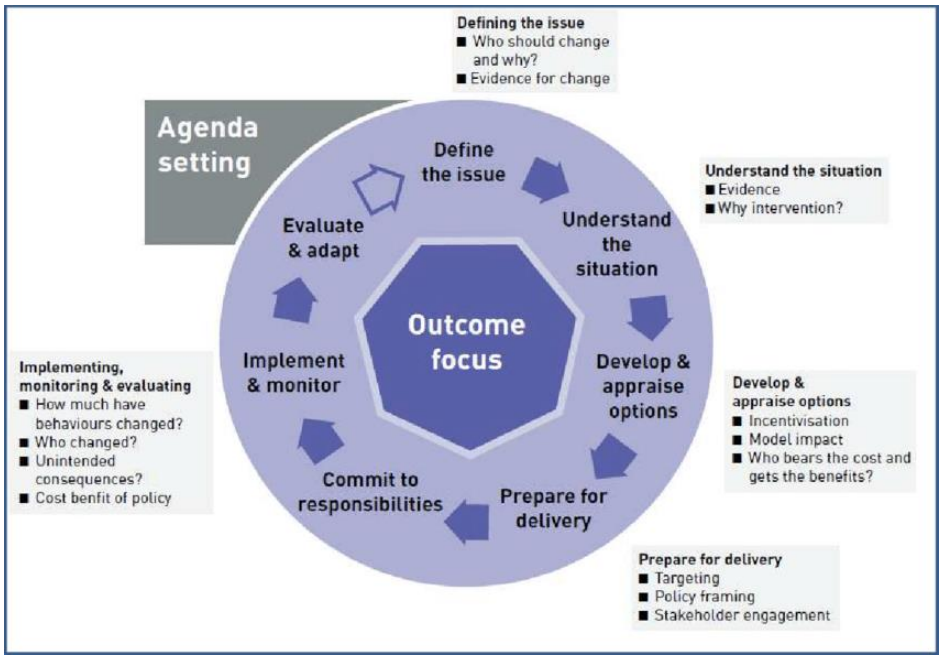


Figure 2-5: 4Es model and its use in policy development
Source: EEA (2013)

The traditional approach for scientific waste, agricultural waste, industrial and municipal solid waste, can be considered disastrous worldwide because it is depleting the natural resources and may pollute the environment if it is not treated/disposed of properly. The current growing awareness of the detrimental environmental effects of current and past

waste disposal methods has resulted in emphasis on this accountability by effective waste management (Abdel-Shafy and Mansour 2018). Simate, Cluetta, Iyuke, Musapatika, Ndlovu, SLubinda, Walubita and Alvarezc (2011) argue that there are better practices followed on current disposal methods such as chemical and effluent treatment as well as recycling and reuse.

2.2.6 Green Campus Initiatives at DUT

The Durban University of Technology (DUT) is amongst the greenest universities in the world. DUT recently participated in the 2019 Green Campuses Conference held at the University of the Western Cape under the theme, “Role of the 4th Industrial Revolution in Higher Education” (Ndlovu 2019: 4).

The DUT Green Campus Initiatives was officially tossed in 2012 with the intention to build an environmentally friendly institution (Motha 2013). Makhuba (2018) states that DUT GCI is affiliated to the Department of Student Housing which is administered by Residence Life as a student-led initiative under the Department of Student Housing and Residence Life. Acuho-I (2019) identified the focal objectives of DUT GCI as to reduce the high consumption of water and energy, promoting environmental sustainability on campus and at DUT residences, reducing waste by recycling, promoting cleanliness on campus, redirecting waste landfills and making students aware of the benefits of recycling and encouraging students to practice recycling on campus.

GCI intend to achieve its objectives through creation of the environmental sustainability programmes in the co-curricular. Peters, Andrew, Canadell, Fiendlingstein, Jackson, Korsbakken, Quere and Paregon (2019) state that GCI successfully presented the university in multiple (ACUHOI-SAC) conferences and competitions where they spoke about Sustainability in the Durban University of Technology. In 2019 DUT GCI took the second place as the Greenest Campus, Greenest Student, two Green Staff Member of the year and Certificate for Contribution to Capacity Development (Acuho-I 2019). Based on the achievement DUT was appointed to host the 7th Annual Green Campuses Conference.

Maistry and McKay (2016) point out that people's attitudes should be influenced using various techniques such as incentives, awareness raising or skills development. Saini (2017) posits that well-motivated personnel are best able to develop and implement energy efficiency policies.

ACUHOI SAC (2016) points out that GCI is about empowering students by meeting their passion and commitment to sustainable change with sufficient encouragement and funding. In forming platforms of engagement that enhance innovation and entrepreneurship through collaboration and partnership, the Initiative invited a variety of guests to contribute and share their knowledge as to how they are practicing a green lifestyle in their daily lives. Yanthi, Yunansah, Wahyuningsih and Milam (2018) declare that "sufficient consumption and sustainable use of fresh water natural resources should be campus community's main concern in establishing a strong foundation of Green Campus Movement".

At DUT, GCI has achieved a lot in terms of knowledge, education, and the implementation from the day of its inception (Motha 2013). According to Motha DUT GCI promotes and encourages environmental sustainability in communities and amongst students through projects. Motha (2013) opines that GCI in DUT uses creative ways to promote sustainability. According to Sibanda (2014) students use recyclable material and paper, plastic and cardboards to create garments.

The students use these garments to compete with one another in a GCI fashion shows. These fashion shows are planned and organized by the students for the students in order to promote reuse and recycling of materials (Zikhali and Dlamini 2014). The DUT GCI team has dedicated Wednesdays as a day to raise awareness by wearing green T-shirts that have different messages addressing the importance of a greening campuses. Messages such as the eight Rs of sustainability – rethink your choices, refuse single use, reduce consumption, reuse everything, refurbish old stuff, repair before you replace, repurpose through creativity and reinvention and recycling would drive the message of sustainability and GCI across campuses.

Initial workshops are held to teach and train all first-year students about environmental sustainability and climate change and to encourage students to be more involved in

finding solutions towards saving the environment. Alam (2018) states that different universities have different approaches. Even within the university, different campuses have a different foci and strengths in their efforts to achieve sustainability. There are commonalities in some areas where all institutions strive to excel, and there are certain areas where improvements in those areas factor a great amount in achieving their sustainability goal.

The DUT midlands has its own way of structuring their conservation initiative. Sibanda (2014) states that DUT GCI has initiated Campus Carbon Footprint Reduction Program aims to practically apply education initiatives and research results around energy saving, developing, and demonstrating sustainable energy practices on the various campuses. According to Zikhali and Dlamini (2014) DUT's sustainability efforts to decrease its carbon footprint have been recognized by the renewable energy company Value SA among others. ACUHOI SAC (2016) argues that in order to achieve sustainability, students need to contribute to the development of new energy systems and green infrastructure.

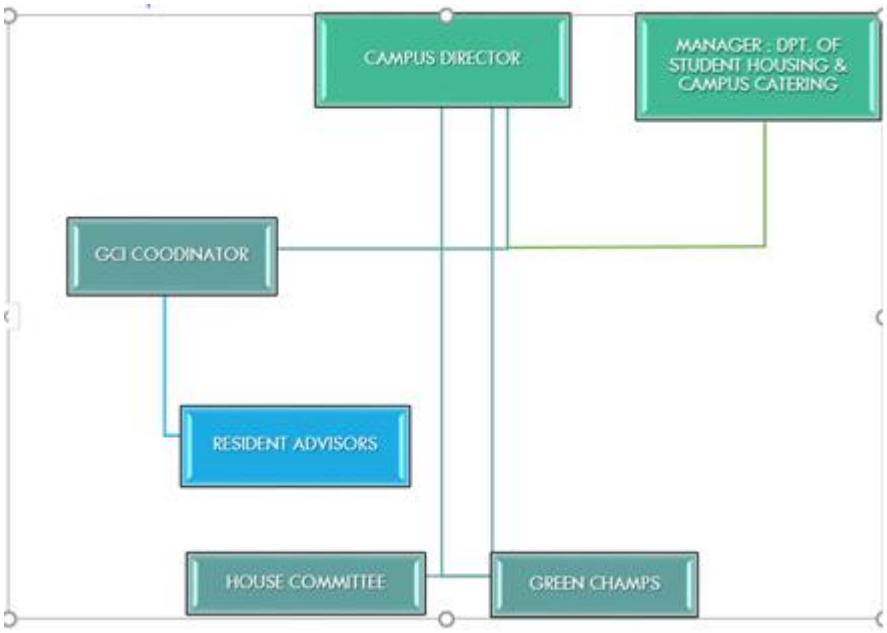


Figure 2-6: The DUT Midlands GCI Organogram
Source: DUT Midlands GCI (2017)

Figure 2-6 illustrates the organisational plan of DUT GCI (2017) at the Midlands Campus to be falling under the office of the Campus Director and the Department of Student

Housing. There is a GCI coordinator who is the engine of the initiative, which include Residence Advisors, House Committee and Green Champions. GCI at DUT just like other universities is not without challenges. According to Maistry and McKay (2016) South African universities also have internal barriers to overcome such as lack of sufficient studies on energy efficiency in their perspectives. The South African Environment Management Act (No. 46 of 2003) was promulgated by Government to regulate the protection the natural environment of South Africa. The act requires every citizen to use ecosystem in a sustainable manner and the active implementation of re-use of natural possessions. The National Water Act No. 36 of 1998, was passed by the Government to control the protection, development, conservation, management, and control of water resources for the country.

These acts and others are steppingstones for universities institutional internal policies development aimed to protect the environment and water resources. These acts and many others have a link to elements of triple bottom line as they advocate for the protection of the natural environment. They are aimed at changing environmental behaviour by teaching about the importance of environmental protections and enforcing this kind of behaviour through fines where required.

The following section of this chapter deals with the theoretical framework used to buttress this study. The two theories derived from the review of literature and relevant to this study are the Triple Bottom Line (TBL) and the Theory of Planned Behaviour (TPB). The TBL speaks to sustainable development and use of resources and the TPB is relevant because GCI is aimed at influencing environmental behaviour of campus residents, student body, staff, and local communities.

2.3 THEORETICAL FRAMEWORK

A theory is a supposition or a system of ideas that is used to explain a phenomenon or an activity under investigation. Like a model it is a set of ideas that have been organised into a coherent system that can be used to explain abstract phenomena. Theoretical frameworks are described as building blocks relevant to all the components of a study.

They contain discussions and examples of the main theories that the study is centered on. They outline the understanding of point of between the theories and the study (Anfara and Mertz 2015). Grant and Osanloo (2014) posits that a theoretical framework and literature review form solid foundations for the study.

Ennis (1999) perceive theoretical framework as a structure and foundation that is used to identify and described major elements, building blocks and relationships that hold the study together and (Rowley and Slack 2017) provide a snapshot view of the context within which the study is conducted. As already stated, the derived theories that underpin this study are the Triple Bottom Line and the Theory of Planned Behaviour.

2.3.1 The Triple Bottom Line

Hammer and Pivo (2016) postulate that the triple bottom line refers to economic, environmental, and social value of an investment and it is related to the concept of sustainable development. Slaper and Hall (2011) state that the triple bottom line is an accounting framework that demands for corporations to look beyond just profits or returns on investments which was regarded as single bottom line. Sachs (2012) argues that triple bottom line is a crucial element of sustainability and speaks to organisations business model, principles and practices to promote the wellbeing of people, protection of planet earth and profit. Today conservation management practices are often incorporated in corporate strategy, values, mission statements and policies and operation procedures (Garret and Heal 2004; Babiak and Trendafilova 2011).

It is through the use of the triple bottom line framework that the private sector has taken strides and identified the need to align itself with non-profit organisations that prioritize the wellbeing of the planet and its people (Slaper and Hall 2011). The need for sustainability reporting led to the realisation that there is a direct connection between environment and resources conservation and profit that is revealed by the triple bottom line.

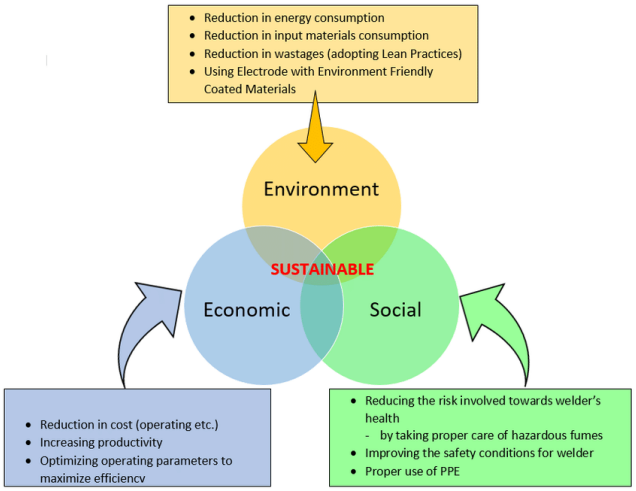


Figure 2-7: Triple Bottom Line
Source: Alkahla and Pervaiz (2017)

Hammer and Pivo (2016); Comment (2013); Slaper and Hall (2011) state that “3 P”s” has created collaboration between people, profit and planet and mentioned that sustainability can be earned from balancing these factors. Triple bottom line has enforced principles that force organisations to involve people as beneficiaries in development and protect natural resources that provide a number of functions that have significant economic value.

These include provisioning (resources such as water or food are provided), regulation (resources provide safety or balance such as flood control or oxygen), supporting (resources provide assistance such as pollination), and cultural (resources provide aesthetic, historic, and other cultural benefits) (Hammer and Pivo 2016). TBL is an accounting framework that demands for firms to look beyond just profit or returns on investments (single bottom line) but attend to the environmental and social effects of a business.

Hammer and Pivo (2016) attest that triple bottom line thinking is informed by and relates to the concept of sustainable development the premise that development should occur in ways that meet the needs of current generations while maintaining conditions and opportunities for future generations to do the same that can be retrieved through modification of human behaviour. The consideration of people, planet, and profit as

principles of triple bottom line relate to the pillars of sustainable development which are economic, social and political, therefore these theories work interchangeable (Sutton 2013). GCI aims to balance economic, social, and environmental perspectives conditions while making progress and development within universities (Tiyarattanachai and Hollmann 2016).

As Figure 2-7 illustrates, for any university to be regarded as sustainable, it should incorporate people (people-centeredness and elements of SHE), the natural environment (reduction of energy consumption, efficient use of input materials and reduction of waste) and profits (increase production, operation efficiencies and cost reduction) in its plans and operations. GCI is about influencing the behaviour of university and local communities through awareness, education, and collaboration. GCI involves planning strategies, activities and practices that will be used to influence pro-environmental behaviour. It is for this reason that the Theory of Planned Behaviour was twined with the TBL to bolster this study.

2.3.2 The Theory of Planned Behaviour

The second theory used to buttress this study is the Theory of Planned Behaviour (TPB), which was developed in 1985 by Ajzen. Macovei (2015) argues that this theory developed from the Theory of Reasoned Action (TRA) (explaining human behaviour on the basis of intention to adopt certain behaviour) introduced by Fishbein and Ajzen in 1975. Mosher and Desrochers (2014) attest that more rewards may accrue for environmentally friendly behaviours. According to Comment (2013) Theory of Planned Behaviour (TPB), stresses that the behaviour of people can be modified to a behaviour that is desirable to a particular situation.

In the case of this study responsible use behaviour is seen as planned behaviour, which Krajhanzl (2010); Steg and Vlek (2009) argue implies a series of plans and actions aimed at reducing environmental harm.

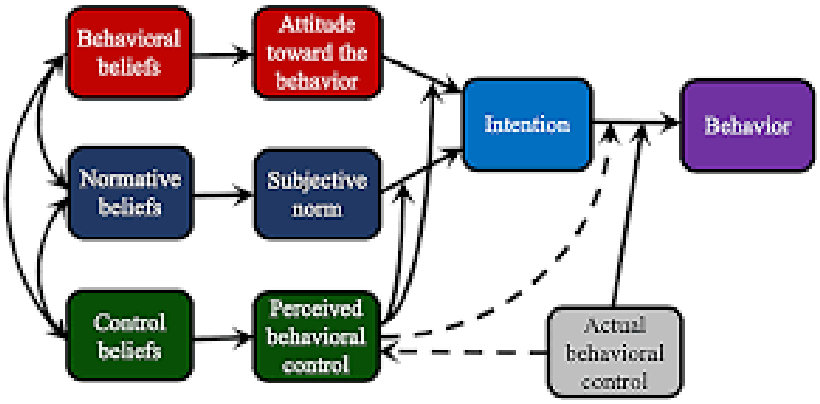


Figure 2-8: Theory of Planned Behaviour
Source: Ajzen (1985)

As illustrated in Figure 2-8, LaMorte (2019) argues that planned behaviour stems from the belief system, the norms of an individual and a group, how much the individual and group believes in control (LaMorte 2019) and are motivated and develop an intention to comply and turn new knowledge into a norm and behaviour system. These will then impact attitudes which lead to intention that shapes pro-environmental behaviour. Basically, the argument is that planned behaviour is intentional and it is informed by a number of values and belief system that GCI aims to inculcate. GCI is a deliberate plan to influence environmental behaviour from an early age which (Steg and Vlek 2009) implies a series of plans and actions aimed at reducing environmental harm.

Just like the TBL, the TPB was chosen to underpin this study because conservation education is one of the strategies that are used to change attitudes and influence behaviour of people towards the environment that supports their livelihoods. The starting points for forging environment-saving behaviour are knowledge and skills acquisition, development of values, changing of attitudes and securing commitment to protect and improve the environment (Duke University 2013).

According to Ajzen (1991); Madden, Ellen and Ajzen (1992) as an extension of reasoned behaviour, planned behaviour centres on subjective norms which influence attitudes and determine behaviour subject to availability of opportunity, knowledge, skills, time, money, and cooperation form, which will dictate the likelihood of desired behavioral change. Steg

and Vlek (2009) are of the view that to be successful, the programme aimed at influencing behaviour should start by identifying behaviour to be changed, examine factors that influence such behaviour, apply intervention, and systematically evaluate the effects of the intervention.

Figure 2-9: The model for delivering behavioural change
Source: Mitchell (2013)

Further, Passafaro, Livi and Kosic (2019) argue that norms and intentions vary across persons and locations (universities in this case) making them collective local norms with control playing a critical role in enhancing then. In Figure 2-9 Mitchell (2013) illustrates approaches in for delivering behavioural change pointing out that in order to successfully change human behaviour, the elements that symbolise desired human behaviour must be enabled, barriers removed, information provided, facilities provided, viable alternatives provided, and capacity developed through education and training.

The university community needs to be engaged through local community co-production and media campaigns. Planned behaviours need to be exemplified by leading examples of the GCI office, university policies and academic departmental projects and activities. Funds should be provided, grants and other incentives be activated, non-compliance be punished through fines and penalties.

2.4 CONCLUSION

As presented in this chapter, there is a plethora of literature on environmental education and green campus initiatives. Green Campus is a complex concept aimed at influencing pro-environmental behaviour within campus community settings. As illustrated in this chapter (Figures 2-1, 2-4, 2-5, 2-6, 2-7 and 2-8) environmental education and GCI is a student-led collaborative effort based on education and training and aimed at developing pro-environmental attitudes through encouragement, support, provision of resources, exemplification of desired behaviour in order to incorporate the TBL principles into development and growth.

It is unblemished that GCI is multi-sectorial including efforts to be energy-efficient, combat climate change, save water and other resources through waste reduction. It is important to set the GCI agenda by defining and understanding the issue, develop options, prepare for delivery, implement, monitor, and evaluate. GCI supports the sustainability agenda through propagation for environmental protection, people-centeredness, and economic growth. Pro-environmental behaviour can be taught and influenced. The chapter also illustrated the importance of the involvement and support of the executive leadership of the university through the development of pro-environmental policies and provision of funding.

Implementing a comprehensive environmental sustainability initiative on a university campus involves making a number of changes. Often the actions required, whether first- or second-order changes to be made, entails that individual change habits or routines that they have maintained for several years, sometimes several decades (Creighton 1998; McKenzie-Mohr 2011). Higher education institutions have not only the responsibility of vocational education, but also the responsibility of guidance of society. Universities provide a medium for both knowledge generations about sustainability issues and technology development to overcome environmental problems.

It is important to note that, university students are the future leaders and consequently, they should be accepted as the pillars of sustainable development of nations (Yuan and Zuo 2013). Municipalities should partner with universities to play a key role in initiating and driving local conservation programmes (Govender 2014).

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

The previous chapter provided information on conservation in higher institutions of learning in a form of relevant literature review underpinning the study. The worth of GCI is on consideration of the triple bottom line theory (people, planet, and profit) and the value of sustainability is portrayed in sustainable development goals. The literature review chapter also illustrated the importance of GCI showing the superficiality of only considering what is obvious and visible to the naked eye about this phenomenon. Some literature outlined the hinderances to sustainability faced by universities.

This chapter focuses on how the study was conducted to achieve the research aims, satisfy the research objectives, and answer the guiding research questions. It also presents the strategy of inquiry based on underlying assumptions and appropriate research paradigms, research design, research approach and data collection tools and methods (Denzin, Norman and Lincoin 2003). Permission to conduct the study was granted by Institutional Research Ethics Committee (IREC) the study was conducted in consideration of academic research designs and methodologies, research ethics and in respect of what was agreed upon by the university. In this chapter target population is identified, sampling techniques and sample sizes explained. Data collection tools, data collection process and analysis methods are also tabled.

3.2 RESEARCH PARADIGM AND METHODS

Paradigms and methods are important because they explain the position or perspective of the researcher, which in turn justifies the methodological choices, approaches and techniques chosen.

3.2.1 Research paradigm

'A paradigm is a basic set of beliefs that guides action, whether of the everyday garden variety or action taken in connection with a disciplined inquiry/field' (Guba 1990: 17). Mason (2014: 50) defines a paradigm as a pre-requisite of perception leading to seeing what you are looking for, your previous visual and conceptual experience and how you are looking. A research paradigm is a set of common beliefs and agreements shared between scientists about how problems should be understood and addressed (Kuhn 2012).

The anti-positivists approach is applied to this study since its focuses on human behavior and also this research is limited to what we can observe and measure, that is, which exists independently of feelings and opinions of individuals (Welmen 2009). The paradigm used in this study is constructivist with qualitative type of methods and data collection tools. The questions were open-ended allowing for emerging data in the form of idea to allow participants to generate meaning and bring personal values to the study. The aim of the study was not just to report on the status quo, but to create an agenda for change (Dudovskiy 2020: 1).

3.2.2 Research methods

In order to satisfy the objectives of the dissertation, qualitative research was done. This study adopted qualitative approach to data collection and analysis. This approach to research is recommended by Meyrick (2006) citing the fact that in qualitative research the objective is exploratory and descriptive rather than explanatory. Robson (2011) elaborated that qualitative approach gives a complex textual description of how people

experience a given research issue. Langos (2014) listed main characteristic of qualitative research is that it is mostly appropriate for small samples, while its outcomes are not measurable and quantifiable.

Meyer (2001) argues on the advantages, that the descriptive nature of qualitative research allows the researcher to provide a description of the experiences of the participants, which either sustain or confront the theoretical assumptions on which the study is based. The descriptive nature of qualitative research enables the readers to understand the meaning attached to the experience, the distinct nature of the problem and the impact of the problem (Meyer 2001). It also gives convenience to the researcher by allowing the use of the most appropriate data collection methods to satisfy the research aims and objectives as started in chapter one.

Lyon and Maxwell (2011) state that qualitative approach provides a fertile ground, somehow it allows the integration of theoretical frameworks and perceptions. This approach alone is sufficient in this study because it offers credibility of research findings by providing a holistic understanding of the problem under investigation (Wagner, Kawulich and Garner 2012).

Qualitative approach was deemed suitable for this research project as the research aim was to explore conservation measures of DUT by closely gazing at its pitfall, success, and future plans with the intension to recommend strategies that will maximize level of environment and resources sustainability. The method used in this study gave the researcher control the line of questioning in an interview, is value-laden, allowed for noting of unusual aspects during observation and allowed participants to provide historical information about GCI (Creswell 2013).

3.2.3 Research Design

The research design that followed for this thesis was a case study approach. Creswell (2007) described a case study as a qualitative approach in which the researcher explores a bounded system over a period of time through detailed, in-depth data from various

sources including interviews, observations, and document analysis and reports a case description and case-based themes.

The case study design was used because it is the best suitable in terms of its ability to make a detailed description of a particular case and its setting, in this case a single university. As opposed to a longitudinal design, this study used a cross-sectional design, meaning that data were collected at a given point in time. There was therefore no room to establish changes in behaviour and trends as would have been the case with the longitudinal design.

One of the main reasons why a case study was most relevant method for this study is due to the nature of the research questions as it aimed at establishing the impact that Green Campus Initiative has had at Durban University of Technology, challenges experiences, ways to deal with such challenges and the way forward. Yin (2009) described three core conditions to consider when selecting the appropriate method, the type of research questions; the extent of control that a researcher has over the behavioral events being studied and whether there is a focus on contemporary events as opposed to historical events. In relations to this study, the form of research questions was what, why and how. According to the guidance provided by Yin (2009), the circumstances of the proposed study represented a good fit for the case study method.

Kezar (2005) discussed a number of reasons why a case study approach was utilized in this study, including: minimal previous research on the topic; the focus on studying a process and recreations to it; the focus on strategies and consequences; and the emphasis on studying a specific context within a bounded system. This study met Kear's criteria discussed by Ntoyakhe (2018) that Green Campus Initiative is quite new and there was few previous research done. The research questions also met Kear's criteria, as they focused on the impact and strategies of greening, and mainly focus of this study contained of comprehending the context of a universities within a restricted system of a particular university.

3.3 RESEACH POPULATION AND SAMPLE

The aim of this study is to determine the role of GCI as an integral part of environmental sustainability platform and efficient resource use at DUT, with the intension to adopt strategies that will lead to maximum level of conservation, also, at identifying employees perception, GCI coordinators and residence life officers and the students GCI membership on GCI as integral office for campus conservation role considering sustainable development goals and triple bottom line approach as well as a theory of planned behavior in campus conservation.

3.3.1 Sampling and sample size

When conducting research many types of sampling are possible, although researchers in qualitative research usually focus on relatively small samples (Lyell 1998). The method of purposive sampling was used to develop the sample of the research under discussion. According to this method, which belongs to the category of non-probability sampling techniques, sample members are selected on the basis of their knowledge, relationships and expertise regarding a research subject (Langkos 2014). In this study, the participants sample that was selected contains strong relationship with the phenomenon under investigation. They carry sufficient and relevant information in the division of DUT green campus initiatives, as they are actively involvement in several GCI conservation initiatives.

Purposive non-probability was the best for this study as it gave the researcher a platform to select respondents to form part of the study population. As a result, one Residence life officers, two GCI Coordinators and fifty GCI members were selected because they have rich experience regarding, GCI operations and they meet criteria of inclusion. Purposive sampling procedure is also based on researcher judgmental as to who would provide the best information required to attain the objective of the study (Brink, Walt and Rensburg 2018). This sampling method was chosen because it is known to be inexpensive, and simple to implement (Acharya, Prakash, Saxena and Nigama 2013).

Singh and Masuku (2014: 11) state that in a population size of 1000, a sample of 91 respondents would yield 95% confidence level in the results with a 10% margin of error. The sample was 50 out of 150 (GCI) members which were recruited using database of people who meet the inclusive criteria. Recruitment email was issued to them through the leadership structures of the Department of Student Housing. Qualitative survey questionnaires were administered to DUT 50 individuals GCI members in alignment with Singh and Masuku confidence levels.

3.4 DATA COLLECTION

A case is qualitative research design that uses multiple methods to investigate a contemporary phenomenon in depth a within a naturalistic setting (Creswell and Plano-Clark 2007). Yin (2009) listed six sources of evidence that inform a well-designed case study namely: documentation, archival records, interviews, direct observations participants observations and questionnaires. Creswell (2009) indicated that a case study employs multiple methods to obtain data because single source cannot be trusted to offer a holistic perspective. For the purpose of this study, the methods were divided into two basic categories of interviews and qualitative questionnaires to obtain a comprehensive viewpoint.

3.4.1 Pilot testing

Pilot study is a small-scale preliminary study conducted in order to evaluate feasibility, time, cost, adverse events, and improve upon the study design prior to performance of a full-scale research project (Sundararajan 2007). Van Teijingen and Hundley (2001) concourse by stating that it also equally aimed to check where the research project may fall short in answers to the research questions. Sundararajan (2007), and Bell (2010) subsequently argue that pilot study help researcher to observe the adequacy and effectiveness of data collection instruments to ensure that they accurately collect required

data that would enable the researcher to satisfy the requirements of the research objectives.

The research instruments used for data collection were interview as well as qualitative questionnaire. These instruments were pre-tested for validity through a trial run. The junior residence life officer and one of GCI coordinator interviews were conducted through one-day run. Few questionnaires were handed over to GCI members and were collected after being answered. The try run GCI membership participants were those that were available during the day of the event. The pre-testing allowed study participants to point out ambiguities on questions and helped to iron out misunderstandings of interview and questionnaire questions. The pre-test participants' responses were contributing direct towards addressing the objectives of the study. Piloting session was conducted to the study population portion that will not form part of the main study.

Validity of the research instruments serves to check if the data collection tools ask relevant questions that would fulfil the objectives and answer the research questions as given in chapter 1 (Gomm 2009). Reliability refers to the ability of a study to produce the same results when redone using the same methodology under the same circumstances. This process checks if the tools have the ability to yield the same results if used exactly the same on different days. Strategies used by GCI to enforce sustainability within DUT campuses may change and also GCI membership, may contain new members every year. Reliability may be harder to test because circumstances may change, and the research tools were not standardised. So, against that consideration results may also change.

3.4.2 Interviews

The interview sample of this study consist of interview participants from Durban University of Technology. A sample of 3 individuals were invited interviewed to participate in an interview to discuss the research questions. The 3 respondents have rich understanding of the department of student housing when it comes to GCI. This research requires expert opinion grounded in experience (Patton 2015). Two of them were GCI coordinators, first

one represented Durban campuses and the second one represented Midlands based campuses.

The third respondent represented residence development officer for both Durban and Midlands student housing offices as the result the residence development office to represent Durban student housing was on maternity leave. It is incline to (Alvesson and Ashcraft 2012), when stating that the utilization of qualitative research interviews depends on the participant availability and chosen in terms of their coverage and the quality of data within their responses not on numbers.

The interviews were in a form of face to face semi-structured. Potter (1996) argues that interviews are valuable tools for collecting data in qualitative research. Langos (2014) state that one-on-one interview method allows the researcher to interact with the participants and to observe non-verbal cues during the interview process. The intention is to identify participant's emotions, feelings, and opinions regarding a particular research subject. Langos (2014) argues that the main advantage of personal interviews is that they eliminate non-response of participants.

In this study semi-structured interviews were conducted with GCI coordinators and residence life officers conducted using a set of questions. The dialogue in this instance was focused on residence life officer and GCI coordinator's views on the GCI programme, the role of triple bottom line and sustainable development goals and if they are embraced in the university sustainability programme. Opdenekker (2006) posits that interviews are qualitative research techniques that aim to draw meaning, views, and deeper understanding of a phenomenon. The interview method allows the researcher to seek clarity and probe for deeper understanding.

The main function of a semi-structured interview is to unpack views, experiences, or motivations on a particular matter (Gill, Stewart, Treasure and Chadwick 2008). Most of the question items were probing to provoke the participants to add other perspectives to uncover new knowledge.

3.4.2.1 Procedure for interviews (Appendix D)

The interviews initially were planned to be in a form of face-to-face. The COVID-19 pandemic transpired, and the country was taken to alert level three of lockdown. IREC recommended for the alterations to be made on the research proposal to do interviews virtually to maintain social distancing. As the result interviews were moved from venue-based to occur online using Microsoft Teams platform. The interviews process took place in December 2020 from the 8th to the 21st (Table 4-1).

3.4.3 Questionnaires

The questionnaire was used to collect qualitative information from GCI membership of DUT. The questions were designed around the research questions stated in chapter 1. Some certain questions were prepared, so as for the researcher to guide the respondents towards the satisfaction of research objectives. These questions were informed by the researcher's curiosity on the role performed by GCI as it deemed as integral office for conservation within universities (Mosher and Desrochers 2014). Questionnaires were also designed based on the literature as expounded in chapter two. The aim was to learn about their knowledge of what was done to intensify sustainability of resources.

3.4.3.1 Questionnaire design (Appendix E)

The questionnaire was developed based on the research objectives and research questions. There were steps that were thoroughly engaged in the development of the questionnaire that included defining the target respondents, Choosing the method, deciding on a question content, putting questions into meaningful order, examining the length of the questionnaire, pre-review the questionnaire and developing the final survey. Its design was the best to obtain qualitative data that incorporated facts knowledge, opinions motives, past behavior, and the possible future of GCI.

3.4.3.2 Questionnaire administration

The questionnaire was a self-administered, this was transpired as to keep up with COVID-19 regulations such as social distancing. The questionnaire was made available to the

respondents via online Microsoft Teams Link forms, where they answered. Completed questionnaires were them downloaded and analysed using the services of a qualified qualitative statistician. The questionnaire administration process commenced on the 11th and ended on the 21st of November 2020.

3.5 DATA ANALYSIS

Mouton and Marais (1991) describe data analysis as the process whereby a phenomenon is broken down into its constituent parts in order for it to be understood better. Raw scores are hard to read as they often do not give a complete picture because they are all over the place. It was therefore important to analyse data using various data representation tools and techniques. Data analysis and interpretation is the process of bringing order, structure and meaning to collected data through the grouping of responses and identification of patterns and trends. These techniques enable the researcher to develop data displays that give an impression of the overall trends in the distribution of scores (Tredoux and Durrheim 2010:19).

3.5.1 Qualitative data

Data collected from the interviews were analysed manually by the researcher because the number of interviewees was small. The services of NVivo 12 qualitative statistician were utilized to dissect the questionnaire data. The data was presented using (Cluster analysis, Hierarchal charts, nodes, coding, word cloud, word trees, and tree map techniques).

Word clouds- Word Clouds demonstrate the most frequently used words. The larger the font implies the more the word was used). This helps to identify key areas/themes. Cluster analysis – Bubble diagrams were used. These diagrams illustrate the data (key words) in the form of bubbles. The larger the bubble, indicates the higher frequency of

words/references. Furthermore, the closeness of the bubbles shows that there was a relationship between those words.

Tree Maps- these show the data (frequently used words) in terms of size of blocks. Hence the larger blocks reflect those words mainly used. The entire map gives a holistic view of how data is placed in terms of size of reference. Word Trees- these are used to depict key words and the words/sentences connected to that word. It allows the reader to see how these words connect to other words and sentences/views. Hierarchy Charts- these reflect the size of the nodes. The larger the size implies the more volume/concentration of responses in that area.

The data coding process started instant when data collection is started. There was a formal coding process that initiated after all of the data are collected. Saldana (2009: 3) described, “a code in qualitative investigation is most often a word that symbolically assigns a summative, salient, essence-catching, and suggestive attribute for a portion of language based or visual data”. Saldana (2009) characterises the coding process as occurring in two distinct cycles:

The first cycle coding process can stretch in magnitude from a single phrase to a full sentence to a whole page of text to a cascade of moving images. The portions coded can be the precise same units, longer passages of text, and even a reconfiguration of the codes themselves developed thus far. Prior codes were grounded on the ideas that I obtained on the literature review before formal data analysis process began. According to (Bazeley and Jackson 2013) NVivo 12 computer software is the most suitable instrument to analyse qualitative questionnaires content effectively and foster good decision making. Data analyses increase the understanding of the phenomenon.

A main advantage of content analysis is that it helps in data collected being reduced and simplified, while at the same time producing results that may then be measured using quantitative techniques (Bazeley and Jackson 2013). Moreover, content analysis gives the ability to researchers to structure the qualitative data collected in a way that satisfies the accomplishment of research objectives.

3.6 ETHICAL CONSIDERATIONS

The researcher conducted this study using internationally accepted methods, techniques, and tools. The researcher made sure that these methods and tools were employed using above board tactics as advised by Cousin (2009: 18); Wagner et al. (2012: 63). All writers of sources of information (books, journal articles and online documents.) were acknowledged and sources entered in the list of references.

The current study was subject to certain ethical issues. According to Joel (2016) research participants should not be subjected to harm in any ways. Respect for their dignity was prioritised. A copy of information letter and consent form was issued to each respondent so that they are informed about the research. The information letter enlightened about nature and the scope of the study. The full consent allowing the researcher to partake the study was obtained from the participants prior to the study. All participants reported their written acceptance regarding their participation in the research, through a signed Consent. This was voluntary therefor participants have a right to withdraw participation from the study or refuse to give information (Brink et al. 2012: 35).

Ethical considerations of this research are aligned with those of DUT will be ensured, the proposal was submitted to the supervisor, to be double-blind reviewed by other academics in the faculty research committee. The research proposal has a series of ethics questions that the researcher had to respond to prior to its approval. Over and above that, the proposal was tabled before the ethics committee to ensure that the study is compliant (see appendices A and B). In agreement with Joel (2016) research participants was not subjected to harm in any ways.

Respect and dignity of respondents was prioritised. For this study full consent allowing the researcher to partake the study was obtained from the participants prior to the study. The study was voluntary, meaning that participants had a right to withdraw their participation from the study or refuse to give information (Brink et al. 2012: 35) (See appendix C). The protection of the privacy of research participants was ensured (Rubin and Babbie 2008). Anonymity was maintained by using code to name the audio

recordings files containing interviewee responses. The consent from the participants is stored in supervisors' offices where they will not be accessed by anyone.

3.6.1 Anonymity and confidentiality

The protection of the privacy of research participants was ensured (Rubin and Babbie 2008). Participants were reassured that their responses were treated as confidential and used only for academic purposes and only for the purposes of the research. Anonymity was maintained through using code to name the audio recordings files containing interviewee responses and files containing answered questionnaires. Anonymity and confidentiality were also ensured through aggregation of data during analysis, which meant that it was not easy to identify participants who gave different responses. The data from the participants remained stored in supervisor's office for confidentiality.

3.6.2 Validity and reliability

Validity is the degree to which the researcher has measured what he has set out to measure, (Pietkiewicz and Smith 2014: 106). According to (Simon and Francis, 1998: 70) validity is the extent to which the measurements of the survey provide the information needed to meet the study's purpose. Validity is crucial as it regulates what study questions to use and assist to ensure that study questions precisely measure the issues of importance, Validity deals with the strengthening of the research. The research tools and fact analysis were evaluated by academics and the scrutiny of instruments was done by experts such as the ethics committee.

The researcher pilot-tested research instruments prior to full-scale data collection. This was to ensure that the questions asked actually addressed research objectives and questions. The pilot study was done using members of GCI that were not sampled in order to enhance reliability of the instruments.

The concept of reliability of the study is about consistent and stability, hence predictable and accurate, it is said to be reliable. Interviews are trusted to extract data that will serve

the aim of the study from the participants of the study, when they respond to the questions asked (Moser and Kalton 2009). Reliability is important to ensure that when this study is done repeatedly should be able to yield same results. According to Yin (1989) the goal of reliability is to reduce the errors and biasness in a study.

3.7 CONCLUSION

This Chapter outlined how the research was conducted, illustrating the process used to select the participants, the method used to collect data as well as the approach. Data analyses were done manually by the researcher and through the qualitative statistician NVivo services. The research aim was to analyse conservation measures of DUT, by closely looking at its pitfall and success, with the intension to adopt strategies that will lead to maximum level of conservation context.

The next Chapter details the analysis process and describes the findings of the research. In consideration of the nature of the investigation, through drawing support from literature the study adopted qualitative research method. Interviews and pure qualitative questionnaires were used to collect data. This was done to get clear, reliable, and valid data sets. The research methods were carefully selected for relevance, validity, and reliability on the study. This chapter enclosed that the information study brings to light in the next chapters answer the research questions and meet the research aims and objectives, yet flexible enough to give room for unexpected new findings to emerge.

CHAPTER 4

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 INTRODUCTION

This chapter presents, analyses, and interprets the findings obtained from the residence life officer, GCI advisors and GCI membership of the university. The interview and questionnaire were the primary instruments used. The residence life and GCI advisors interview transcripts are presented separately from the students' questionnaires, as their questions focused on different spheres of GCI management. All interview transcripts and questionnaires were examined and considered to be in a good state to be analysed.

This chapter is critical since it is where the researcher presents essential information obtained utilizing the methodology expounded in chapter 3. In this chapter the researcher identifies patterns and trends in relation to the research aims (Vosloo 2007: 356). In this chapter the researcher seeks to determine the level of understanding of GCI among selected permanent academic staff members and students across the campuses of DUT. Their responses are presented, analysed, and interpreted to satisfy these research objectives initially stated in chapter 1.

- To assess the progress on the Green Campus Initiative Programs.
- To examine the impact that the GCI has had at DUT.
- To determine the challenges of implementing GCI at the DUT.
- To investigate mechanisms of promoting GCI at DUT.

The service of NVivo 12 statistician were sought to analyse data collected through the questionnaire because the number of questionnaires was big. Data collected from the interviews were analysed manually by the researcher because the number of interviewees was small.

4.2 INTERVIEWS

Section 4.2 of the chapter presents interview data. As motioned in chapter 3, three interviews were conducted one with residence life officer and two with GCI advisors. This was done with the intention to unpack the role that is played by Green Campus Initiatives to sustain electricity, water, and environment and to draw meaning and to give a deeper understanding of the phenomenon. Interviews were conducted via MS Teams to observe requirements for social distancing as discussed in chapter 3. Table 4-1 captures the dates, times, and duration of the interviews:

Table 4-1: Dates, times and duration of interviews

	Date	Time	Duration
Interview 1	21/12/2020	16:19	24m:14s
Interview 2	08/12/2020	11:52	27m:11s
Interview 3	09/12/2020	11:54	39m:12s

4.2.1 Position and involvement with GCI at DUT

Interviews were conducted with two Green Campus Initiative Residence Advisors and a Residence Development Officer. The respondents were named Respondent 1-3 to protect their identities. *Respondent 1* was mainly responsible for providing structure to GCI and helping with programs planning and implementation. *Respondent 2* had started as a house committee member. Respondent 2 described GCI as an ongoing program aimed at natural environment conservation, water and power conservation, recycling, and cleanliness. *Respondent 3* described GCI as one of the networks within the department of student housing composed of Insika and Qhakaza substructures, which report to the residence development office.

4.2.2 Period of involvement with GCI

Respondent 1

My involvement with GCI commenced in 2016 where I was the residence advisor at Riversend outsourced residence. My portfolio was heading the GCI programme that was initially introduced in 2016.

Respondent 2

I have been involved since 2016 until today. Now I serve as the Advisor on GCI student movement.

Respondent 3

I started being involved in 2018 with GCI when I was the president of the house committee, at that time GCI was known as a substructure that reported to the Central Housing Committee (CHC) to liaise with the residence development officer.

Two of the respondents had been involved with GCI for 5 years and one had been involved for 3 years. From the responses of Respondents 1 and 3, GCI seemed to be the prerogative of residences with no mention at all of the academic departments. The students and residence advisors in DUT residence are the only people who administrate the GCI movement. According to the Mafongosi (2018), Minister of Higher education Dr. Nzimande on the launch of GCI mentioned that GCI that GCI initiation programs is the responsibility of students and staff members across the campus.

4.2.3 DUT campuses that participate in GCI

Respondent 1	*According to GCI membership database 2020, the majority of student participants are from Steve Biko, followed by Ritson, City, ML Sultan, Indumiso and Riverside campuses. Participants are second- and third-year students.*
Respondent 2	*All campuses participate. My answer will be based in midlands because that is where I am based in terms of advising. Both Indumiso and Riverside campuses students are participating immensely in ensuring that they raise*

awareness of conservation amongst their peers and surrounding community.

Respondent 3 *The GCI is not only based in student housing department, but to their entire university. As much as we do have structure to facilitate GCI operations, it is not limited to the housing department. Based on my observation and on my analysis the Durban campuses specifically Steve Biko is more active when it comes to ensuring that this initiative is known, and the duties are being carried out accordingly.*

According to two of the respondents, even though all campuses are involved, Steve Biko (which is the main campus of the university) is the most active when it comes to GCI.

4.2.4 Number of staff and students that participate in GCI and nature of participation

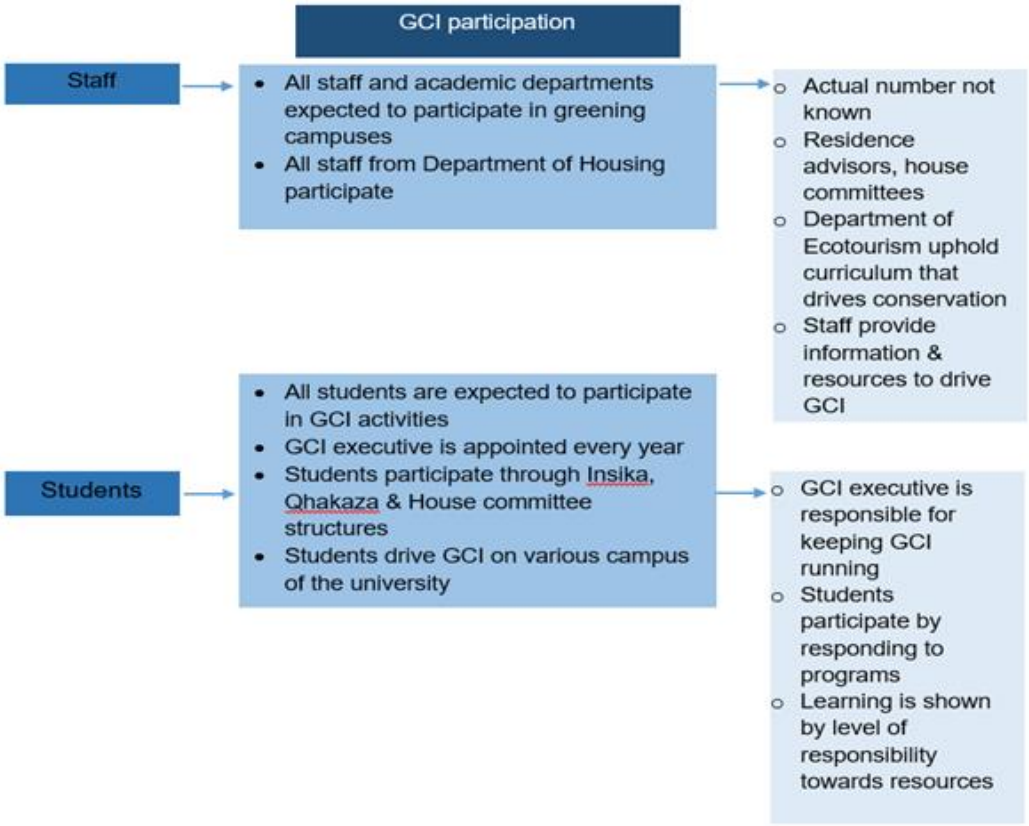


Figure 4-1: GCI participation

Figure 4-1 shows that all staff and students across all campuses are expected to participate in GCI. Academic departments are expected to participate to provide information that will help students run GCI by themselves. It is clear that the Department of Housing is very instrumental in driving GCI through residence advisors, house committees and student substructures such as Insika and Qhakaza.

4.2.5 Policies in place to enforce GCI at DUT

Respondent 1

There are no specific policies that I am aware of that regulate conservation in DUT. The behavioural change strategies and perspectives that speak to sustainability are the frameworks used. Instead of the policy, the green campus initiative is achieved through consistent sustainability education that is offered to GCI membership.

Respondent 2

The GCI is a very critical movement that is worldwide recognized, so there might be or there are international, national, and local regulations that are cascaded down to the university for the example in residences there are rules about GCI, obviously all those rules are informed by the policy on what disciplinary measures are being taken to students who disobey green campus initiative ethics.

Respondent 3

There is no known exact policy, but as I mentioned before we do have structures in place where there is a structure, I believe that there is a policy. I may not speak for the GCI structure, within student housing forum but I believe that for other structures under student housing there have policies to back up their existence. There can be no structure without policy because the GCI at DUT is submerged under Central Housing Committee policies. They do not have the document that mainly speak to them. There is a newly revised policy for the House Committee outline all the structures including GCI to endorse their existence.

4.2.6 Position of Executive Management on GCI

Respondent 1	*The GCI executive management believe that the initiatives taken to address a particular problem. They are salient to ensure that there is the conservation of plants,*

electricity, water, and things that are referring to campus greening are taken seriously. Their aim is to ensure that everyone is educated about GCI. They believe that GCI affects more than one person, it does not affect one campus or university, but it is something that affect the whole world that a reason we are affected by climate change and global warming. GCI is there to influence people perception to knowing the importance of conservation and repercussion for failing to conserve.

Respondent 2 *The GCI executive seeks more initiatives to be done in improving student's perception about GCI. They believe that there must be educated about green economy. The executive emphasized that GCI represent environment and resources conservation. The GCI should stick to institutional perspectives that has close link to environmental sustainability, engagement, and stewardship.*

Respondent 3 *The GCI executive management demanded the specific Campus sustainability policy to regulate the conservation within the university. This emanates from the multi-universities conferences that are held yearly that capacitate them with wisdom to enquire specific policy that will state what role that everyone should play in GCI.*

4.2.7 Initiatives taken to capacitate university stakeholders

Figure 4-2 DUTs GCI stakeholders

According to Katiliute et al. (2017) the GCI cannot be achieved without the participation of stakeholders. From the figure 4-2 the GCI stakeholders were revealed, the GCI have two categories of stakeholders “internal and external”. The internal stakeholders included students and staff. The external stakeholders included surrounding schools, media, other universities, high education associations (ACUHO-I), KZN Wildlife Ezemvelo and Umngeni waters. The movement hosted annual summits to capacitate all forms of stakeholders with new techniques to improve sustainability status. The institution held a summit in 2017, which was attended by the likes of Umngeni Water, KZN wildlife Ezemvelo, DUT and UKZN students, local schools, and the media. In this summit reflected on the GCI purpose, discussed challenges that were faced.

4.2.8 GCI and plant protection at DUT

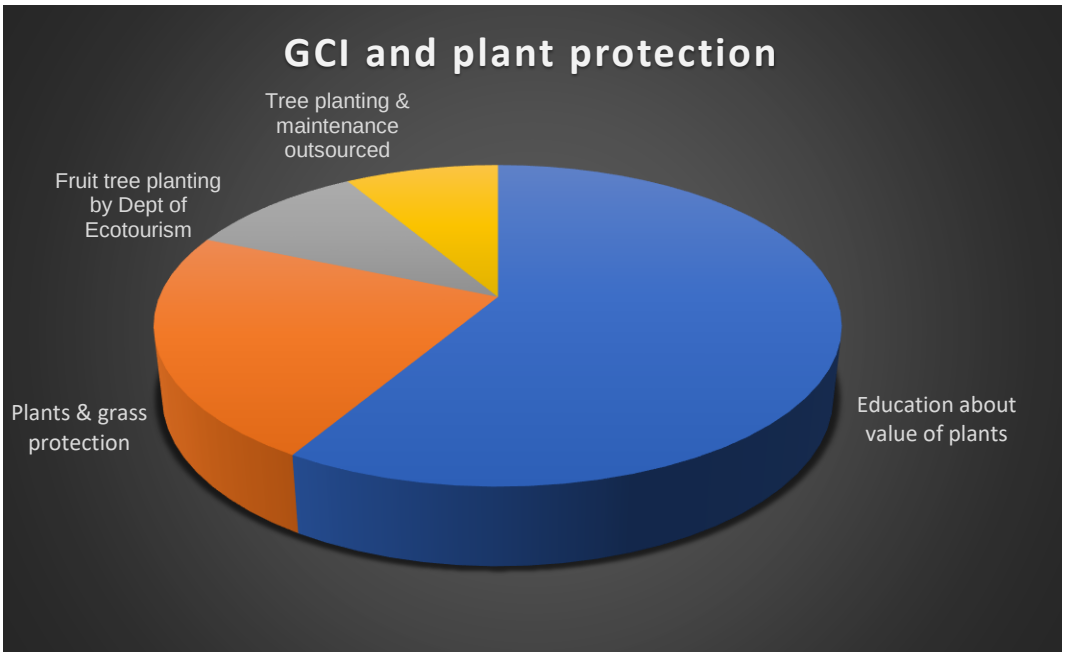


Figure 4-3: GCI and plant protection at DUT

Figure 4-3 presents data on relationship between GCI and plant protection at DUT. As illustrated there tended to be consensus that GCI educated students about the value of plants. Figure 4-3: classified GCI and plant protection relationship into four groups.

Education about value of plants dominates (59%) the sample as a single category and remains a big role player in the protection of plants. The results affirm the role of the education about value of plants at DUT. The plants and grass protection were represented as second leading category with 23%. The figure affirms the role of fruit tree planting amounts to 10% of the effort. Tree planting and maintenance outsourced category amounts 9% of initiatives taken to protect plants at DUT. This in line with the view that Aleixo et al. (2018); Tiyarattanachai and Hollmann (2016) hold of the preservation and conservation of resources for future generations to balance economic, social, and environmental conditions at campus level.

The data has made it clear that planned behavior somehow is the only working option to achieve plants appreciation with campuses. This is shown by the majority respondents mentioned education of students about value plants can contribute on plants protection. Holding seminars, workshops and conferences about role of plants in the ecosystem yearly can benefits students who are new entries at university and revive conservation on the seniors' students.

4.2.9 GCI and water and electricity conservation at DUT

Figure 4-4 presents data on relationship between GCI and water as well as energy saving at DUT. As illustrated, there were a number of initiatives underway to try and save both water and power. These included according to the order of frequency installation of water tanks across campuses used to capture rainwater and use for irrigation and sanitary purposes. Metre boxes were installed on participating campuses in order to measure usage and encourage improvement. Competitions were held and prizes won by residences that showed improvement. The GCI members also spread information through posters on walls. Education was another factor driving water and energy saving. Solar panels, light sensors and solar-powered mobile charging stations were installed. Students were taught to observe power hour, encouraged to unplug unused appliances, switch lights as well as geysers off when not required.

Figure 4-4: Water and electricity saving through GCI

The ideas supported by the participants of using solar panels and other energy-saving technologies, light sensors, and others (Fig. 4-4) is supported by Bulunga and Thondhlana (2018) in their study of action for increasing planned energy-saving behaviour in student residences to limit the use of non-renewable sources of energy (Weenen 2000).

4.2.10 Challenges faced by GCI at DUT

As discussed in chapter 2 there are a number of challenges to GCI implementation. Filho et al. (2017) singled a lack of institutional sustainability policies as the major challenge. Filho et al. (2019) further pointed out that institutional transformation was necessary for more reception and implementation of and supportive of GCIs. Figure 4-5 presents data on relationship between GCI and its challenges. As demonstrated, there were multiple encounters that prohibited the GCI to properly implement sustainability. These included

according to the order of frequency insufficient knowledge about conservation amongst students. There was insufficient education that was provided to GCI membership and students population about the necessity of conservation of resources and environment. There were no specific policies in place that were designed to regulate sustainability agendas. Absence of proper GCI structure was the factor that led to poor coordination of the GCI campaign. The inadequate resources were also the factors that prevented GCI from reaching their maximum impact. There was poor benchmarking conducted in neighboring and sister Universities by GCI.

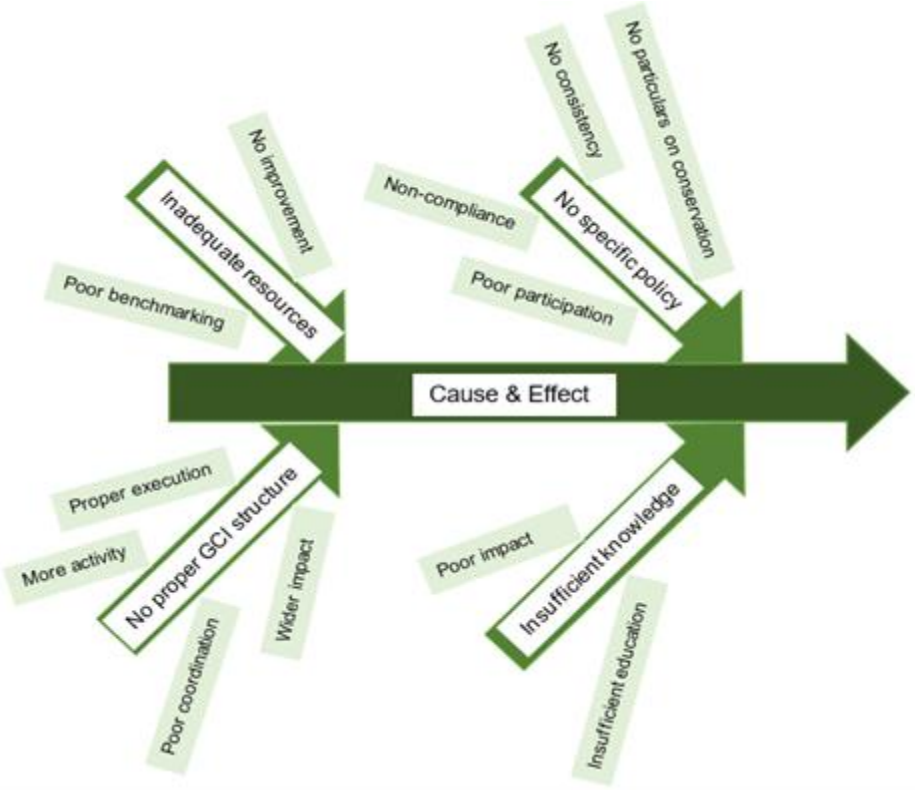


Figure 4-5: Challenges faced by GCI at DUT

The lack of proper execution was the problem when it comes to sustainability programs. There was poor participation of students in the GCI conservation awareness programs. No improvement was among the challenges that were experienced by GCI. There were no compliant to the conservation strategies that were stipulated by GCI. No consistency when it comes to conservation was another factor that was happening at DUT campuses.

There was no wider impact that was done by GCI conservation activities, their impact was only limited to DUT campuses. There were no particulars of conservation. More intensive conservation activities are not deployed by the movement, the data review that GCI implemented fewer activities that are related to conservation. Coleman (2019) felt that some universities were dragging their feet when it comes to implementing GCIs. Rwelamila and Purushottam (2015) found that many universities were struggling to fully implement the GCIs due to lack of financial resources, lack of motivation and lack of sustainability policies as also identified by Arroyo (2017); Genta et al. (2018); Mafongosi et al. (2019); Velazquez et al. (2005); Sharp (2002) in chapter 2.

4.2.11 Strategies to overcome mentioned challenges

Figure 5-6 presents data on the strategies that could be used to overcome the current challenged faced by the GCI. There were number of possible strategies that were outlined to try and improve the effectiveness of GCI. Securing enough annual budget was sought to allow expansion of the impact.

Figure 4-6: Strategies to overcome GCI challenges

The budget would allow flexibility to acquire up-to-date knowledge, new skills and to develop and implement intensive GCI programs. The initiation of the sustainability policy were raised as the solution to curb problems that were encountered by GCI. The policy will enforce and regulate the sustainability within the university. The policy will provide more details of what GCI should entail and will enforce participation. Coordination was the strategy aimed at overcoming GCI shortcomings, it included the provision of a proper GCI structure to coordinate planning and programs.

The coordination of green campus initiative will also drive effective communication across campuses. The investment in the use of social media will assist the sustainability movement to reach wider community. The GCI collaboration with CELT for skills and with academic departments for more knowledge is significant. The collaboration will equip GCI leadership with innovative skill and knowledge to intensify conservation awareness programs. Policy is the prerogative of university leadership. The responses were in line with the thinking of Bull et al. (2018); Grindsted (2011) that the policy framework should support GCI. Policy would inform planning, setting of goals and reallocation of resources as suggested by Thiry (2004); Wesecup et al. (2016).

4.2.12 The future of GCI at DUT

As long as resource over-utilisation is a problem, human beings need to adapt and innovate as advocated by Amaral et al. (2015). In the words of Genta et al. (2019) education is the key to dealing with the problem of overexploitation of resources. Education is a deliberation act aimed at influencing behaviour and the future blueprint of GCI is aimed at improving the implementation of sustainability DUT. The theory of planned behaviour is ingrained in the things which need to be addressed by GCI at DUT. It is ideally prevailed that the green campus initiative should have its own department with own resources, this will improve the influence that the movement have on resources and environmental conservation at DUT, it could also allow the initiative to successfully carry out wider sustainability attempts. Figure 4-7 indicates that GCI could reclaim its victories

of being the greenest university in South Africa, it could be achieved by preaching conservation within DUT environment.

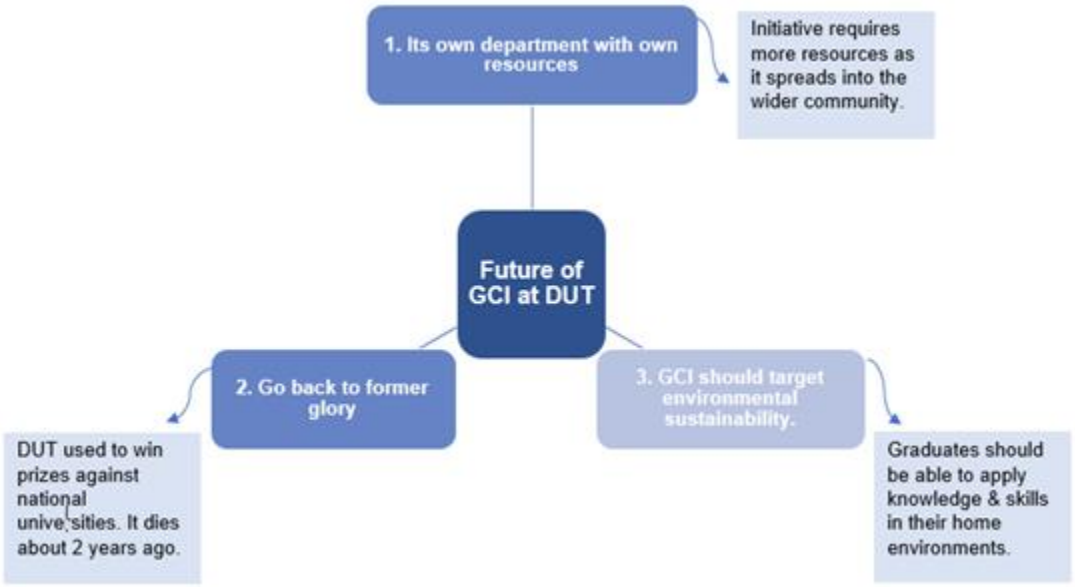


Figure 4-7: The future of GCI at DUT

GCI would move towards environmental sustainability to sustain the DUT teaching and learning environment in all spheres. The university graduates intended will be equipped with knowledge and skills that could be used to practice sustainability in their home environment. The future prediction of GCI talks to the triple bottom line and the planned behaviour theory that underpins this study.

4.2.13 Other comments and questions regarding the study

Respondent 1 — *I could not imagine anything better than to supplement this investigation since it will genuine help the college in general to ensure that they champion the issues looked by GCI and on the grounds that the GCI is the workplace that can elevate the power and water saving guidelines. The examination will help on CELT division where I am working all day at, it will assist use with methodologies that we can use to react to the call made by top administration which expect us to show*

	students the natural supportability since it part of college columns.
Respondent 2	*I will be straightforward about this inquiry. Since now the contribution of DUT midlands in GCI is by all accounts fluctuating it was doing very well in earlier years so now, as 2018, 2019 and 2020 we didn't see numerous projects that were done to help GCI.*
Respondent 3	*What is this study for and what does this study seek to inform and how it will help in rectifying the challenges encountered by GCI?*

4.3 QUESTIONNAIRES

There were 50 green campus initiative members that were targeted to participate in the study. They were target because they are the role players in keeping GCI running. The total of 50 questionnaires were distributed and collected via MS Teams as per the requirement of the Higher Degrees Committee to avoid and minimize contact during the time of COVID-19. The questionnaires were issued to all respondents on the 11th of November 2020. They were given a period of two weeks to return their responses, luckily all of them were able to respond before the deadline. All 50 questionnaires were returned, which yielded 100% response rate. The questionnaires were examined and considered suitable for analysis. However, Due to the nature of the research objectives, qualitative analysis was applied to all qualitative responses. It brought out a variety of subthemes which were aligned to the research objectives.

4.3.1 Age of the respondents

Responses were spread across various age groups starting from 18 years as per the advice of Andrews and Herzog (1986: 403). All of the research participants were over 18 years of age, which meant that their responses were mature and thoughtful enough to respond to the objectives of the study.

4.3.2 Number of years involved with GCI

Figure 4-8 illustrates the number of years participants had been involved with GCI. It is clear that the majority of them (40%) had been involved with GCI for a period of 2 years, followed by those who had been involved for less than a year (22%). Those who had been involved for a period of 3 years formed 14% followed by those who had been involved for a period of 1 year (12%). As expected, those with the bigger number of years of experience were in the minority at 12% (6% with 4 years, 2 % with 5 years and 4% with more than 5 years).

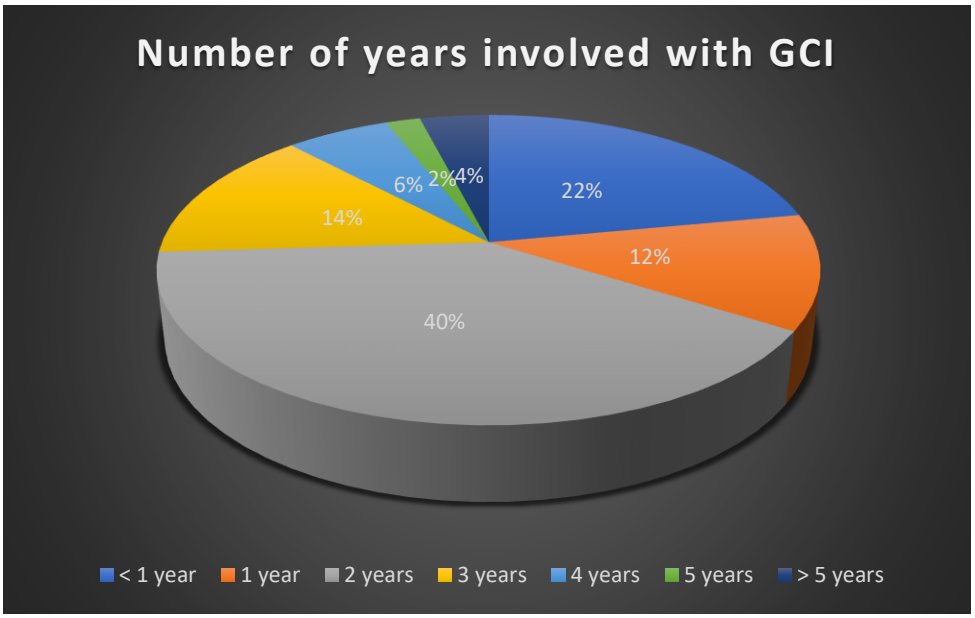


Figure 4-8: Number of years involved with GCI

This question was significant in order to determine the level of understanding of participants of GCI. Those who had been involved for less than a year (22%) could not be expected to have a full understanding of GCI especially as the year 2020 when data were collected was an abnormal year characterised by less university activities.

4.3.3 Nature of involvement with GCI

As illustrated in Fig. 4-4, the majority of participants were general members (56%) made mainly of students. Other participants were GCI representatives (14%), GCI executive members – chairperson, public relations officer, secretary, (12%), green champions –

involved in creating awareness and facilitating GCI programs about the natural environment and cleanliness (6%), House committee members (4%) and founder member (2%).

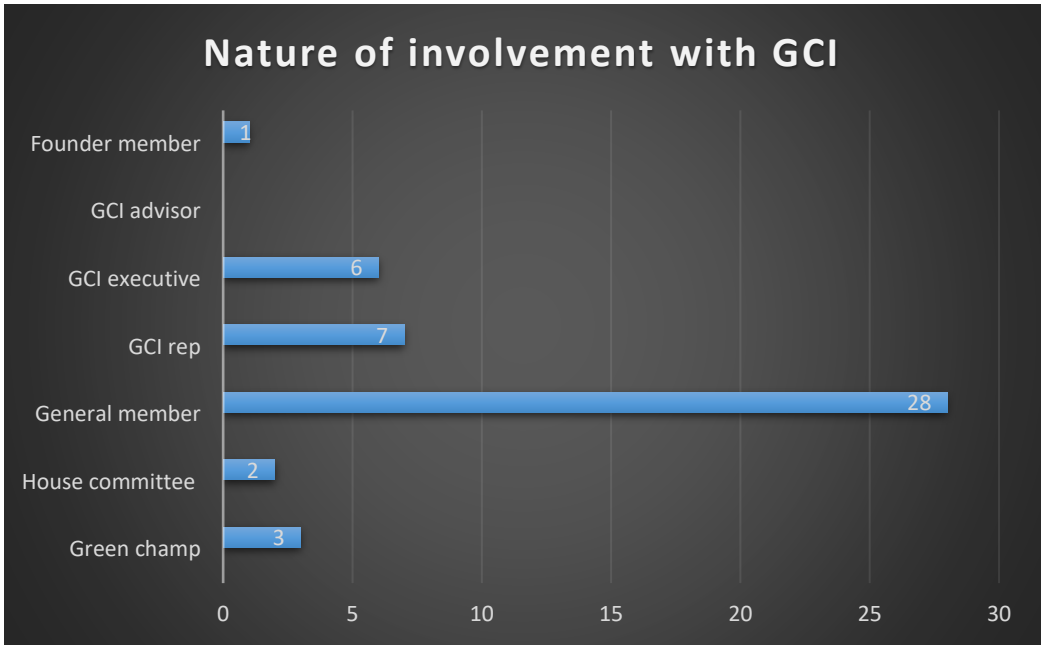


Figure 4-9: Nature of involvement with GCI

Figure 4-9 captures the nature of GCI involvement of the participants. This was an important question as it would inform the study about the various roles that members of GCI played.

4.3.4 DUT's GCI involvement with other universities

The results of DUT's GCI involvement with other universities are presented in the figure 4-10 below. The figure shows the data (frequently used words) in terms of size of blocks. Hence the larger blocks reflect those words mainly used. The entire map gives a holistic view of how data is placed in terms of size of reference.

The participants were approached to give their insights of the DUT's GCI involvement with other universities. Figure 4-10 presents the impressions of the participants on the

DUT's involvement with other universities. Participants responded that DUT was an advocate for sustainability among other universities in South Africa. DUT had driven awareness, engagements, and collaborations on sustainability. The university's involvement with other universities when it comes to GCI had a coverage of 8.79%. This was made of three references, namely: DUT's engagement with other universities (4.33% coverage), DUT and other universities collaboration and networking on awareness and environmental education (2.51% coverage), and the last reference was DUT driving environmental sustainability and conservation in DUT and other areas around DUT and in other universities (1.95% coverage).

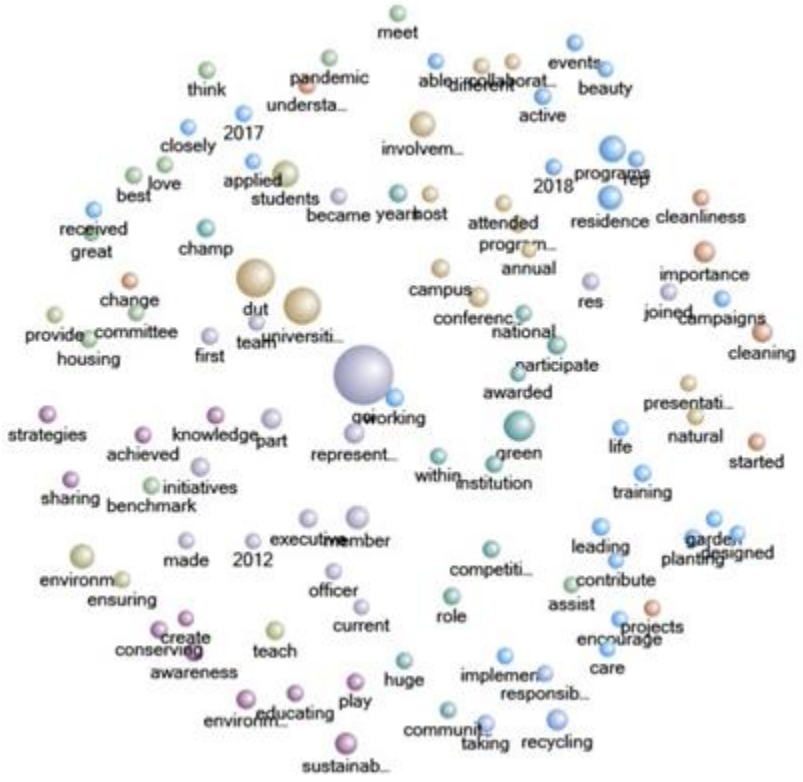


Figure 4-10: Involvement with other universities

Figure 4-10 highlights that DUT played a very important role and networked with other universities in the periods 2017 and 2018. Its involvement with other universities included among other competitions on cleanliness, beauty pageants and fashion design,

conservation ideas, recycling, events, etc. to promote benchmarking and sharing of best practices.

4.3.5 Envisaged approaches to dealing with litter on campus

In this section figure 4-11 demonstrate the most frequently used words. The larger the font implies the more the word was used by the respondents. This helps to identify key commonly used strategies when dealing with litter on campus.

The participants were asked to provide the envisaged approaches to dealing with litter on campus. The figure 4-11: presents the impressions of the participants of the approaches to dealing with litter on campus. Members felt that this would rely upon educating individuals on the negative effect of litter and contamination. The venture must be made on adjusting individual's behavior to unadulterated harmless to the ecosystem. This coincides with the Theory of Planned Behaviour (TPB), when stressing that the behavior of people can be modified to a behavior that is desirable to a particular situation.

Envisaged approaches to dealing with litter on campus had a coverage of 9.67%. The responses were made of six main references namely: educating people about strategies to curb littering and advantages and disadvantages of littering (1.70% coverage), sharing of information about the impact of littering (1.50% coverage), educating and capacitating communities about the dangers of pollution towards the environment (1.17% coverage), educating people on bad impact the filthy university has on visitors eyes (0,93 coverage), educated about the implications of littering (0.89%) and educating people about littering (0.67% coverage) as illustrated on Fig. 4-11. Again, education as a planned way to influence behaviour feature high in the responses as per the arguments of Alam (2018); Bulunga and Thondhlana (2018); UNESCO; UN (2015).

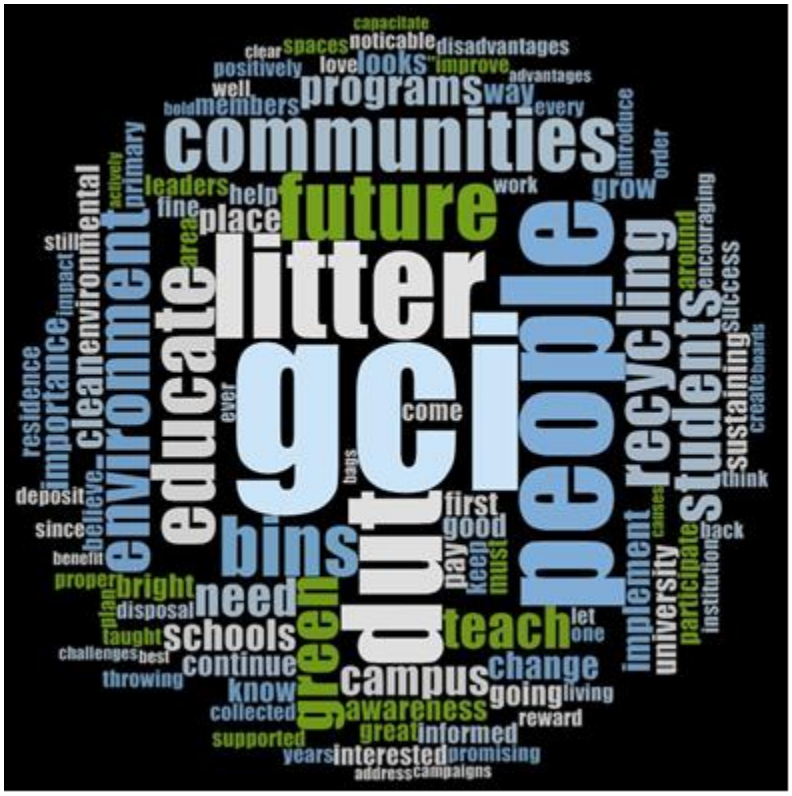


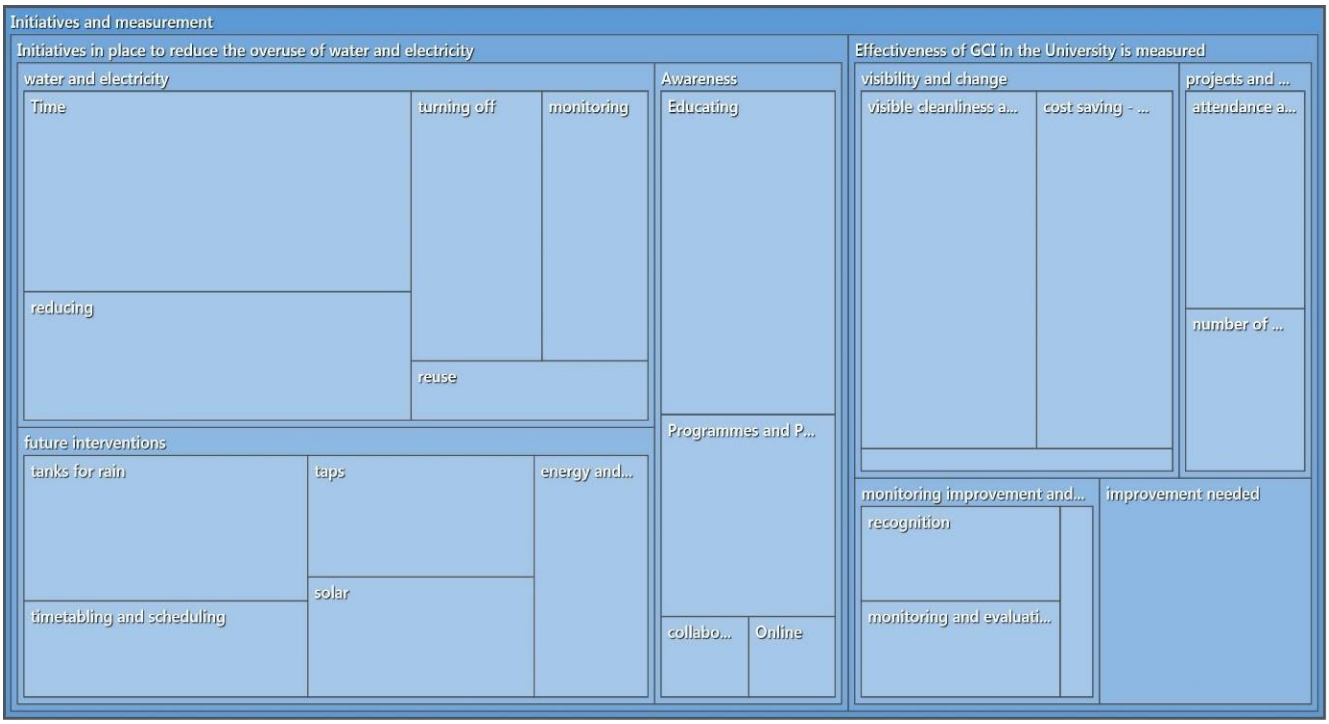
Figure 4-11: Approaches to dealing with litter on campus

4.3.6 Initiatives in place to reduce water and electricity usage

Table 4-2 reflect the size of the nodes regarding initiatives to reduce water and electricity usage. The larger the size implies the more volume/concentration of responses in that area.

The participants were questioned to give their impressions of the initiatives in place to reduce water and electricity usage. That was an important question as it would inform the study about the initiatives that were in place to reduce water and electricity usage. Table 4-2: shown the initiatives to reduce water and electricity usage. Participants said that there was a novel initiative to reduce usage of resources that were based on time. They were termed as power-hour, dark hour and shower hour. Power hour, dark hour and shower hour entailed using electricity and water sparingly.

Table 4-2: Initiatives to reduce water and electricity usage



The initiatives to reduce water and electricity usage had a coverage of 16.89%. This was made of nine references, namely: dark hour its where both water and electricity is not used for an hour and just have educational games (1.25% coverage), students residences used to have a program called power hour where some electricity plugs were switched off for one hour and use lights only (1.89% .coverage), saving electricity is to have uncountable dark hours in a whole place at the same time, for that we can save a lot (1.43% coverage), dark hour at my residence recently (1.76% coverage), had a dark hour once or twice a week whereby each residence switches off light for an hour (1.05% coverage).

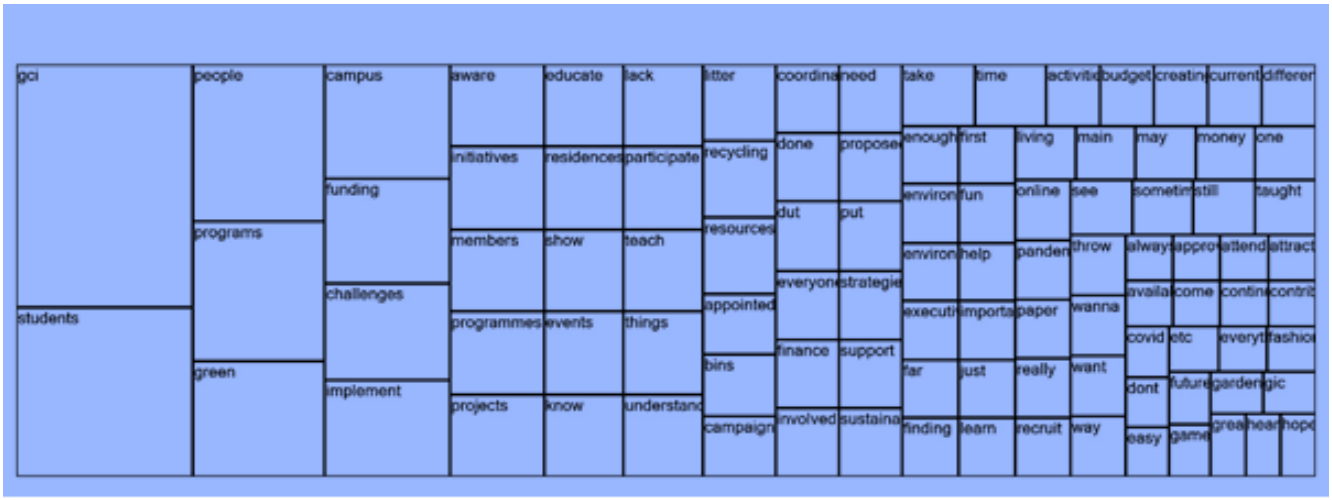
From the nine references four were emphasizing on how water usage was reduced, namely: shower hour proposed by the current GCI Executive to be implemented at the first-year residencies (3.17% coverage), shower hour initiative seeks to regulate the usage if water through having a timeframe which student will use less water (2.90% coverage), and that shower hour was aimed at saving and reducing water usage and using it for other purposes (1.53% coverage).

4.3.7 Strategies to measure effectiveness of GCI at DUT

The figure 4-3 display the data (frequently used words) in terms of size of blocks. Hence the larger blocks reflect those strategies that were mainly used to measure the effectiveness of GCI at DUT. The entire map gives a holistic view of how data is placed in terms of size of reference.

The respondents were asked to share their thoughts regarding of strategies to measure the effectiveness of GCI at DUT. Figure 4-3 illustrate the impressions of participants of strategies to measure effectiveness of GCI at DUT. Participants felt that the effectiveness of GCI would be determined through evaluation and monitoring its impact. The monitoring of electricity and water bills accounts must be done on a monthly basis to keep records of litres of water used each month. The monitoring of students' adherence to saving routine remains a critical determiner of GCI effectiveness. The effectiveness of GCI at DUT is also measured through the successful implementation of conservation awareness programs and their impact on students saving behaviour.

Table 4-3: Strategies to measure the effectiveness of GCI at DUT



Strategies to measure the effectiveness of GCI at DUT had coverage of 17.44%. This was made of five references, namely: GCI has a huge positive impact (6.27% coverage), it is measured with the low bills received by the university from the municipality (1.39%), GCI have helped to reduce usage of water by putting showers instead of bathtub and

sensor light in the bathrooms (2.05%). At leased residences evaluation is through bill to analyse the impact of the initiatives were (2.86% coverage) and GCI monitoring by checking if there are any student who sleeps with their light on at night and monitoring the amount of water used in each residence per month (2.69% coverage). In chapter 2 we saw how in a study conducted on the impacts of GCI across a number of universities in China Xia et al. (2012) linked GCI to economic growth, and how McArthur and Sachs (2002) emphasised the need to measure the impact of GCI and link it to future rather than past achievements. That would be achieved by investing in long-term energy and water saving technologies and influencing behaviour in the long term. The threats of short-term and unsustainable efforts to GCI identified by Xia et al. (2012) were apparent in the responses at DUT.

4.3.8 Challenges of GCI implementation

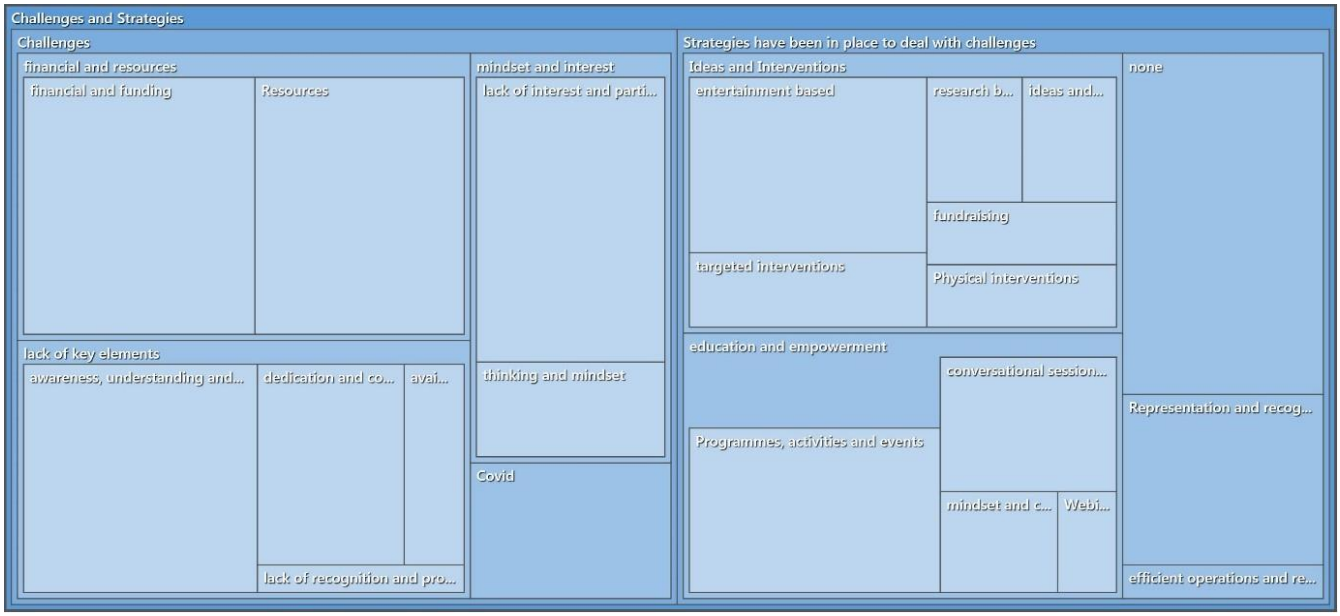
The table 4-4 reflect the size of the nodes in relation to challenges of GCI implementation. The larger the size implies the more volume/concentration of responses in that area.

In view of the respondents, the biggest challenge to GCI implementation is that it is viewed as an appendix to existing systems rather than a revolution and a paradigm. This was evident in the responses given by the participants regarding challenges to GCI implementation. The table 4-4: shows their impressions on the challenges of GI implementation. Participants perceived finance and resources to be the biggest challenge, not realising that this was an effect. In order to mitigate the challenges raised by the respondents there must be adequate financial sponsorship from the institution management.

There was also an evident lack of dedication and commitment towards GCI as felt by many respondents. Challenges faced in implementing the GCI had a coverage of 20.56%. This is made of eight references, namely: GCI struggling to implement the event because of lack of finances (2.94% coverage), lack of resources (1.18%coverge), cumbersome processes (2.84% coverage) and lack of a budget/donations to support the initiatives. Students funded themselves by contributing their own money (4.45%

coverage), funding is the main challenge (2.20% coverage). The last challenge was lack of commitment from the university community (1.95% coverage).

Table 4-4: Challenges of GCI implementation



4.3.9 Possible strategies to deal with mentioned challenges

Figure 4-12 (Word Clouds) demonstrate the most frequently used words. The larger the font implies the more the word was used). This helps to identify key strategies that were used.

Figure 4-12 presents the impressions of participants on the strategies to solve GCI challenges at DUT. In a collaborative study conducted in Serbia, Portugal and Brazil, Krstic´, Filipe and Chavaglia (2020) advocate for transitioning to renewable energy sources and improvement of the whole business environment to support strong, sustainable and competitive modernised industry. This required a big shift in the way in which universities operate, teach, and assess. The participants were asked to give their impressions on the possible strategies to deal with the challenges of GCI at DUT. Participants felt that conducting formal or informal research jointly with academic

departments could empower people with alternative solutions. The GCI needed to ideally be funded by the institution itself, however, they could do their own fundraising as well. Edutainment remained the core element to keep the interest of people on GCI movement. Possible strategies to deal with mentioned challenges had a coverage of 8.45%. This was made of six references, namely: making sure that students are entertained and love GCI (16.42% coverage), fun activities such as competitions to attract more students (17.05% coverage), sponsorships to promote eco-systems across all campuses and residences.

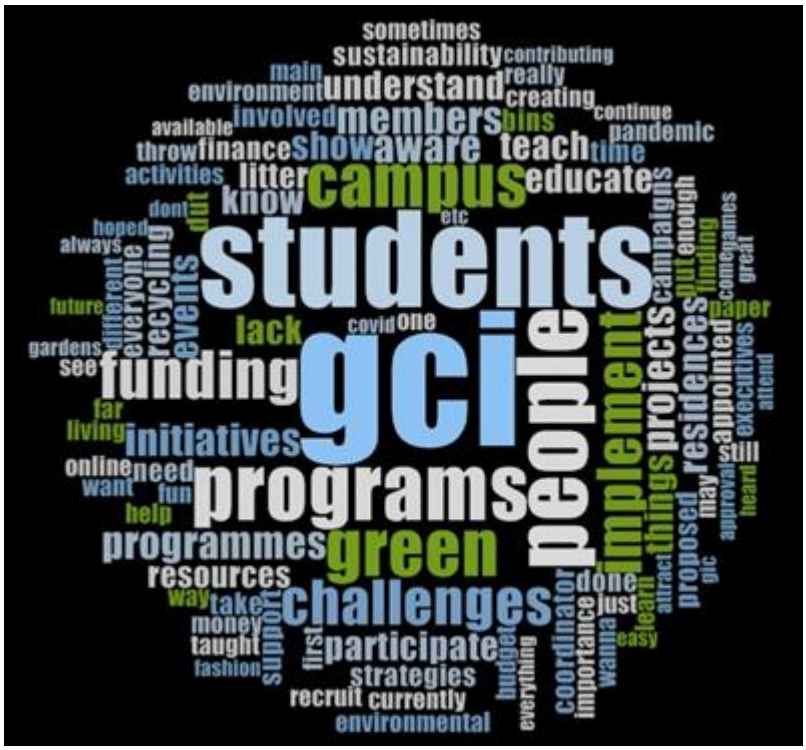


Figure 4-12: Possible strategies to deal with mentioned challenges

(16.59%), more litter bins across campuses and residences (16.27% coverage), GCI leadership should try raise money for funding (15.69% coverage) and finding innovative methods of keeping all campuses green and sustainable (16.43% coverage). It was pleasing to realise that participants were thinking about innovation even though there was no emphasis of sustainability of the efforts.

4.3.10 The future of GCI at DUT

Table 4-5 (Tree Maps) these show the frequently used words in terms of size of blocks. Hence the larger blocks reflect those words mainly used. The entire map gives a holistic view of how data is placed in terms of size of reference.

The participants were asked to give their impressions of the future of GCI at DUT. Table 4-5 presents the impressions of participants of the future of GCI at DUT. Participants felt that this would depend on institution of strong leadership with an office of its own. The leadership must be dedicated and driven towards the goals of GCI such a reducing letter on campuses and inventing novel ideas on recycling. The future of GCI at DUT had a coverage of 21.45%. This was made of five references, namely: good quality leadership (15.33% coverage), GCI having its own department and office (15.6% coverage), the future of GCI is promising as long as people invest more time in GCI (16.04% coverage), GCI has to be driven by motivated and selfless leaders which will see the university going international (15.6% coverage) and the last reference was commitment of members to accomplishing GCI goals (15.95% coverage).

Table 4-5: The future of GCI at DUT

4.4 DATA INTERPRETATION AND SIGNIFICANCE

Going green has become the buzzword of the 21st century but developing countries are lagging behind. The data interpretation revealed strides that were emerged to enforce the practice and achievement of conservation within DUT campuses. The GCI have used multiple approaches to raise awareness and the need of saving resources within the perimeters of the university, it is shown from the data that competitions, contextualised box monitoring, programs and conservation education were utilised to equip with knowledge and encourage students and staff to look after resources.

Weenen (2000) substantiates the approach of providing conservation knowledge towards people when arguing that the limit of non-renewable resources should be considered by people equipped with the understanding of the relationship between energy use, climate and resultant negative impacts of reckless consumption and overexploitation and other unsustainable practices. Also, Bulunga and Thondhlana (2018) authenticates the environmental education approach when mentioning that changing the human behaviour around resource consumption is at the midpoint of nearly all global environmental challenges, comprising climate change and global warming.

The approaches used by GCI at DUT satisfies the intentions of the research objective 5 when disclosing the current mechanisms of promoting GCI at DUT. These campus efforts have resulted in DUT being recognized as a university that ranks among the leaders of the green campus initiative movement. The GCI of DUT collected accolades previously known as the greenest campus in the years of 2014, 2017 and 2018. The data from respondents were able to respond to the study objective 1 when stated staff and students' structures who are the participants on the GCI movement also revealing that there is no proper GCI management structure. Tan et al. (2013) emphasised the need of having a proper leadership when stating that to make the GCI efficient, a strong university-level leadership and coordination organization need to be established. The above authors raise the benefits that could be achieved when designing and implementing relevant GCI managing structure.

The implementation of GCI was not smooth at all. There were tremendous obstacles stemming from the lack of policy and ad hoc adoption of GCI. The effects were numerous and debilitating. They included insufficient knowledge about conservation amongst students, absence of proper GCI structure and poor coordination of the GCI campaign, the poor participation of students in the GCI conservation campaigns, lack of funding and laisses faire attitude of management.

Filho et al. (2017) witnesses that there were many barriers that prevent GCIs from being fully implemented, with one significant trend being a lack of institutional sustainability policies. There were factors that informed the sustainability policy at DUT that incorporated the nature of problems that are experienced and from the responses as a central solution to all DUT conservation problems. This was the same policy that governs sustainability in other organised environment sectors not unique to high institution of learning conservation only. This information has served the interests of research objective number 4 as mentioned in chapter 1. There is a need for changes in the approaches to conservation in order to be relevant to the current and changing university environment. Planting of fruit trees across the campuses was the newly crafted method by the Department of Ecotourism to promote sustainability.

4.5 CONCLUSION

Chapter three presented the study's research methodology and research design which included a discussion and described of how data was gathered from residence life officer, GCI advisors and from GCI members using interviews and qualitative questionnaires. This chapter gave a variety of responses from both interview and questionnaire qualitative data sets. It brings light to the significant role of GCI at DUT. As much as it is a fact that every office and department has its own daily challenges to overcome in order to reach their potential, GCI at DUT was facing several obstacles. GCI has number of strategies to overcome the inherent obstacles, the strategies were discussed within the context of two separate themes: Strategies to overcome mentioned challenge and the future of GCI at DUT. These embody the core strategies that emerged from the data, which would be supported by literature as reviewed in chapter 2.

The study is current and covers a very fertile area. Going green has become the buzzword of the 21st century but developing countries are lagging behind. It is therefore very good to see a higher education institution becoming a leader in the going green initiative by striving to create a green campus. In summary, the study finds that the institution is indeed a leader in the chosen area of a green campus. There are various initiatives in place and GCI champions and representatives are seemingly trying hard to instill a GCI culture, but participation is lacking from the general student population and improvement is needed. Funding seems to be a defining factor on the success of green campus. However, funding seems to be lacking. There is also a need for executive leadership support. The measurement of effectiveness is still based more on visual change/cleanliness of environment and also based on financial saving on energy and water stemming from innovation and commitment.

There seems to be a lack of a standardised measurement of the impact of GCI, which can be looked at going forward. There are some good ideas and future strategies that can contribute to the growth of the initiatives but again, it is dependent on funding, involvement, and support. A mindset, attitudinal and culture change are needed toward GCI supported by deliberate actions to influence behaviour in the long term. However, the institution has come a long way and is setting a good example for other local institutions to follow. The institution should take it to the next level and try to compete at an international or continental level.

The findings presented in this chapter have revealed that GCI has embraced the ethical imperative of environmental stewardship and developed a practical approach to integrated theory into practice in this regard. Chapter 5 provides a summary of these findings linked to research objectives and the overall aim of the study. The chapter also demonstrates how they connect to the conceptual framework of the triple bottom line and planned behaviour as well as the literature reviewed in chapter 2. Chapter 5 also highlights the recommendations based on the findings, the contribution of the study and areas for further research.

CHAPTER 5

FINDINGS, RECOMMENDATIONS, CONTRIBUTION AND CONCLUSION

5.1 INTRODUCTION

This section of the study aimed to assess if the finding of the study as presented in chapter four in consideration to the research objectives. Leslie (2008:105) a chapter such as this one gives an argument of the principal discoveries from the study and where relevant, joins the literature to the research objectives. In agreement, Plano Clark and Creswell (2015) state the goal of the findings chapter is to give the translation of the outcomes and get back to the first reason for the research and unite all previous chapters to examine all qualities and shortcomings to assist readers with understanding towards investigation generally meaning importance and application. This chapter is crucial because it ties the whole project together from the research objectives, literature, methodology to data collected and summarised in chapter 4.

5.2 FINDINGS ALIGNED TO OBJECTIVES

As stated in chapter 1, the aim of this study was to determine the role of GCI as an integral part of environmental sustainability platform and efficient resource use at DUT. In order to fulfill this aim, the study was guided by the following research objectives used to structure the presentation of the findings:

5.2.1 Level of understanding of GCI among selected permanent academic staff members and students across the campuses of DUT

Theoretical findings

The study found through literature that better understanding of the concept of sustainability within higher institutions of learning could address some grave resources and environmental problems. Filho et al. (2018) the universities throughout the globe have progressively become more conscious of their effects on the environment and have made significant efforts to expand their knowledge of the conservation elements. The staff and students leading greening initiative has influenced a number of universities staff and students to consider saving their universities resources. There was symbiotic relationship between learning something and understanding something, Mututu and Thondhllana (2016) conservation could be prescribed through behavioral alterations by means of making staff and students utilize environment, water, and energy wisely yet it. Also, an alternative of mandatory regulations that frequently collapse.

The green campus initiative administrators have made tactical focus on improving the sustainability status core (Thiry 2004). Rwelamila and Purushottam (2015) declared that the successful and efficient administration of sustainability initiatives have been derived through the integration of project management principles and establishment of specific framework to guide approaches taken towards conservation. The writers raised the need for the people leading sustainability to have a particular frameworks and skills to conceive indelible impact. Furthermore Cohen et al. (2018) indicated that sustainability campaign leaders have influenced universities infrastructure developer to incorporate the savings components to save energy, environment, and water. Zou and Zhao (2015) revealed that the universities deemed sustainable have provided good environmental practice in all of it departments and expanded environmental issues solutions to the society as a whole and championed the move towards sustainability.

The study found that as easy as it may sound, using principles of triple bottom line and the planned behavior to raise awareness among staff and students. Choi, Oh, Kang and Lutzenhiser (2017) expressed a desire for strong university level leadership is also a contributor in transition process from ordinary campus to energy and resources efficient campus. Literature state that several western universities such as Tokyo university,

university of Mexico and Tsighua university thought their innovative staff and students have reduce the usage of resources (Teah et al. 2019; Wanxia and Yonghua 2015). The literature revealed that South African universities have ingrained green lifestyle into their organisational culture and realized business transaction attached to sustainability practice (Moodley 2012; Brand South Africa 2012).

Empirical findings

The study revealed that staff and students that were part of respondents they highly recognised the critical nature of GCI. Themselves they were able to incubate activities geared towards attaining a cleaner and greener university environment. This included being involved/coordinating in programmes and hosting residence related activities such as movie nights and ensuring student participation. They were also involved with other universities when it comes to GCI. The entire Durban university of technology students and staffs were able to support the GCI delegates during South African universities (ACUHOI) annual competitions on sustainable development.

The students GCI members mentioned that GCI such requires members who execute their role with passion to achieve desired results. The findings discovered that the staff and students of DUT mentioned their actual roles and also emphasised the importance of being involved and the empowerment achieved through GCI. They have gained backbone and knowledge on how to contribute towards eliminating global warming. This insightful expertise could be transferred to their communities and companies where they are going to be employed.

5.2.2 The progress on the Green Campus Initiative Programs

Theoretical findings

The study through literature discovered that sustainability programs should be guided with frameworks to achieve enhanced environmental and resources conservation outcomes. The universities sustainability objectives should be inclined with Sustainable Development Goals (SDGs) (Weber 2017). This allowed universities to lower a set of pressing global concerns such as energy and environmental exploitation through

programs. A good top-level design is also important for the construction and operation of energy and resource efficient campus programs.

According to Foo (2013) the campus sustainability group implemented the use of bicycles as they are environmentally friendly mode transportation as it produces no air or noise. Some of the suggestions were around sustainable development practices necessitated by urgent need to lower the use of fossil fuels. Studies by Alberts, Gurguc, Koutroumpis, Martin and Napp (2016); Sintov, Dux, Tran and Orosz (2016) on universities and student residences show that GCIs have accounted for relatively high savings of about 30 percent.

The literature identified the focal duties of GCI as to reduce the high consumption of water and energy, promoting environmental sustainability on campus and in residences by reducing waste by recycling, promoting cleanliness on campus, redirecting waste landfills, and making students aware of the benefits of recycling and encouraging students to practice recycling. These actions they responded to the UN declaration that confirmed the leadership role of higher education institutions in advocating for sustainable development (United Nations 2012).

The literature found that universities have developed and pledged on sustainability compelling Talloires declaration (Alam 2018). The declaration has significantly and continuously improved the level of awareness in higher institutions to have positive contribution on the environmental enhancement (Clugston and Calder 1999). The declaration serves as a day-to-day mind map to towards sustainable higher institutions of learning. Based on Alam (2018) the declaration enables the universities to cover all important elements of sustainability such as increased awareness, create culture of sustainability on campus, educate students for responsibility citizenship, foster environmental literacy, practice ecology at institutions, collaboration between disciplines, involve all stakeholders, increase outreach across the nation and the world and maintain the movement.

Empirical findings

The findings have revealed that DUT gone miles when it comes to implementing programs and achieving sustainability targets. DUT involved an ongoing itinerary cycle

of greening prospective, improving green campus initiatives, and driving the university wide exertion. This university extensive attempt was participated in by a different make-up of students, residence advisors and staff contributing to the implementation process. Through GCI successful programs DUT has gained recognitions for being the best in GCI. The findings exposed that such time was the years of 2017 and 2018.

The findings indicated that GCI programs DUT evolves with time and are focused on internal and external spheres. The finding indicated that they had the most impactful programs that included plant protection, shower hour, power hour and monitoring consumption rate. The monitoring was the key program that was used to identify the improvement. Lately has initiated one residence one garden project to drive two SDGs that are alleviate hunger and the promotion of global awareness on sustainable consumption and protection of environment.

The GCI collaborated with other external establishments that included other community, government, and universities on programs. The programs were extended for other universities to join, similarly, DUT join other universities for their programs. The findings also revealed that many universities are motivated by DUT to follow suite. Conferences and other large-scale platforms were seen as the main platforms for engagement. These were annual GCI conferences attended by many universities. The nature of and types of programs done by DUT were so incline with the triple bottom line theory when they included the focus on environment protection, involved other external parties and they also reduces money the university spends on water and electricity bills.

5.2.3 To examine the impact that the GCI has had at DUT

Theoretical findings

Rauen, Lezana and da Silva (2015) stated environmental education as one of the principal determinants of sustainability, contributing to the essential understanding of the relationship and interaction between mankind and the environment and promotes public environmental ethics regarding the ecological balance and quality of life. It is awakening individuals and organised social groups the desire to participate in the conservation. The

GCI has made people more informed, better knowledgeable, accountable, and principled (Misbahul, Lilia, Subahan and Muhammad 2013).

From the literature Hartman (2016) attested that the institution of higher learning has influenced students and staff to develop conscious towards saving their institution resources. Literature revealed responding to Tung Ha et al. (2019:109) when pointing out that that sustainable consumption must be widely understood. As the result environmental literate people has shown improvement on resources usage spotted by authors such as Bower and Phukani (2018); the fundamental objective of environmental education is linked to the theory of planned behavior, people who have received the education on sustainability develops a concern and consciousness towards environment and its problems. Misbahul, Halim, Meeran and Fairuz (2013) also declared that they portray ethical behavior towards sustainability.

The universities sustainability impact has been examined using Green Metrix. Don (2017) the aim of the Green Metrix is to assist the universities in identifying the conservation improvement made by look and assessing their practice, achievements, and direction in relation with the effort to combat global climate change. The Metrix examine the indicators and give based on the saving achieved on each indicator that include green statistic, energy and climate change, waste, water, and transportation. UI Green Metrix (2015) The Metrix provide outcome based on current sustainability status linked to universities.

Allen and Marquart-Pyatt (2018) declared that universities have engaged on energy audits and greenhouse gas inventories and have helped to investigate the availability and costs alternative practices and technology. Ferrao and de Matos (2017) declared that the reduction of 15.5% of energy use from energy audits were the results of the saving initiatives at China universities.

Empirical findings

Findings depict that measurement of effectiveness is still based more on ‘visual’ change/cleanliness of environment and also based on ‘financial’ saving on energy and water. There seems to be a lack of a standardised measurement, which can be looked at going forward. That there were techniques that were used by GCI to assess it impact such as, monitoring and evaluation of effectiveness that was done in certain instances

via reports as well as random selection of campuses to determine levels of pollution, and recognition was also perceived as a form of measurement. This included different forms of recognition such as the winning of awards, participation in competitions and recognitions by executives of the programmes and GCI as a whole.

The study revealed observing as the most common way of measuring cleanliness, water, and electricity accounts usage rates. This included seeing lesser pollution and more greening initiatives and seeing if such accounts were reducing/lowering on a monthly basis, then it was a good indication that people were adhering to GCI. Furthermore, water and energy saving accessories such as bulbs and showerheads contributed to resources conservation.

The study findings perceived Behavioral change as another indicator of measurement whereby people stopped littering and wasting water and electricity (through leaving taps and lights off), then this served as some sort of impact of GCI. Lastly, attendance to and levels of participation in GCI programmes /organisation would indicate that more people are willing to be involved and that GCI is saving seen as an important issue.

5.2.4 The challenges of implementing GCI at the DUT

Theoretical findings

Holzbaur et al. (2013) argued that achieving sustainability is a complex challenge fashioned by population explosion and facilitated development that is detrimental to the environmental and resources. Tiyarattanachai and Hollmann (2016), World Commission on Environment and Development (1987) mentioned that problems emanate from the imbalance of economic, social, and environmental conditions. Weenen (2000) raised a problem that people are not equipped with the understanding on how to utilize non-renewable resources sparingly. Bulunga and Thondhlana (2018) mentioned that human behaviour around resources consumption is at the midpoint of sustainability challenges and Jafari (2013) added that climate change is also instigated mainly by greenhouse gases produced by human activities, for example the burning of fossil fuels and deforestation.

According to Glazewski and Esterhuyse (2016) challenges of implementing sustainability are global, the worsening in the environmental quality in the southern African region has been observed. Tung Ha (2019) confirmed consumption patterns are tremendously high in certain fragments of the world. Tiyarattanachai and Hollmann (2016) further pointed out that the consumption of resources precisely water and energy by students is four times more than a regular resident.

Rwelamila and Purushottam (2015) found that many universities are struggling to battle sustainability issues through different points such as curricula, services, research and in practice. Arroyo (2017) stated the most common challenges, the lack of financial resources, lack of motivation and lack of sustainability policies. Katiliute et al. (2017) further reported that having an inadequate budget might result in universities not being able to fully commit to sustainability projects as some of the need monetary resource for them to be successful.

Empirical findings

The findings of the study have revealed that there were two major challenges faced by GCI at DUT. These impediments included resources shortage for greening strategies suitable for implementation. Funding seems to be a defining factor on the success of green campus. However, funding seems to be lacking. There is also a need for executive leadership support. The findings says that funding issue has been leading concern hindering progress and limiting the impact of green campus from reaching the ceiling.

Relating to the above, there was also a lack of resources and time management, resources included equipment, space, and consumables. There was also a lack of human resources such as a GCI coordinating official which compromises the effectiveness of GCI at DUT. Participation is lacking from the general student population and improvement is needed. Students did not seem eager to learn more about GCI. Participation in programmes was not at the level where it should be. There seems to be a lack of a standardised measurement, which can be looked at going forward,

There was a direct connection between the responses made by respondents and some of the literature in chapter 2. As it seen in the literature, in the past the universities used to have policy to regulate sustainability, this policy is no longer active. The study also

revealed that there was no internal policy to regulate green campus initiative at Durban university of technology. These difficulties were not remarkable to the DUT grounds. The writing shows that universities overall are confronting comparative difficulties.

5.2.5 Mechanisms of promoting GCI at DUT

Theoretical findings

The study discovered that there were mechanisms that could be espoused to encourage conservation activities, reduce its shortcomings, and serve as the driver of sustainability programmes in universities. With rising fuel and electricity costs, universities are gradually moving to conservation and efficiency alternative to avoid exhausting it resources (Beringer 2006; Cole and Wright 2005). Allen and Marquart-Pyatt (2018) many campuses management have taken strides to drive sustainability in this regard GCI have played in helping to identify innovative and effective ways to drive sustainability.

In the literature Fonseca (2018) expounded that the ecofriendly behavior amongst higher institution of learning population is widely acclaimed as inexpensive and pathway towards a sustainable future.

Parker, Oddar and Manoylov (2017) stated that some campuses executed several water conservation mechanisms that include installing low-flow water fixtures, waterless urinals, and mechanized sensors of sinks. Parker et al. (2017) argued it is a challenge to keep people interested in saving, despite the argument by Parkers et al., Wanxia and Yonghua (2015) pointed out that Tsinghua University had achieved 30% reduction in water usage by adopting new irrigation technology for plants.

The literature frequently marks on the importance of programs to inculcate sustainability. EEA (2013), Leygue and Spence (2016) attested that the provision of appropriate incentive program encourages reasonable resources consumption practice and encourages students and staff to partake in sustainability awareness campaigns. Wisecup et al. (2016) also seemed to think that setting a common objective and prize for its achievement creates an optimistic competition to sustainability. Investing more on innovative programs would be a great investment. Fischetti (2013) on literature indicated

that universities have invested on innovative science and postulated that the whole world might generate all of its energy from wind, water, and solar sources by 2030, which could be facilitated by education, research and subsequent innovation.

Simate et al. (2011) argue that there are improved practices on present dumping procedures such as chemical as well as recycling and reuse. Acuho-I (2019) stated that the universities have reduced waste by recycling, encouraging cleanliness and making students mindful of the profits associated with recycling. Tiyarattanachai and Hollmann (2016) were of the view that universities, their leaders, lecturers, researchers, and students could engage their resources in responding to the waste management challenges by maintaining a balance between the economic, social and environmental quest factors.

Empirical findings

In the case of DUT there are various initiatives in place and GCI champions and representatives are seemingly trying hard to instill a GCI culture. It is therefore very good to see a higher education institution becoming a leader in the going green initiative by striving to create a green campus. The act of executing green campus initiative at DUT involved utilising multiple systems of the university, which included academic, supporting department and research.

The most noticeable mechanisms that DUT occupied with was based on the current responsibilities. A close look at DUT uncovered that the campus had executed various green campus projects since the dispatch of the GCI. Generally recognisable, DUT executed a wide reusing program, moderately set number of water tanks, and collecting rainfall water for inundating landscaping. These procedures can fill in as models for different universities that are hoping to actualize comparative activities.

One more critical of mechanism at DUT was an emphasis on environmental stewardship. DUT utilised an assorted procedure of arriving at the campus community with an end goal to energise learning about environmental sustainability. This procedure involved the consolation of teaching through external the lecture hall through extra-curricular exercises. The students of DUT were offered the opportunity to learn about the environmental sustainability, in a form of entertainment-based interventions where the

ideal was to maintain their attention. The findings also revealed that students were keen to attend and participate in event and programmes that were fun, creative, and entertaining. The impactful program was edutainment that incorporated fashion shows, talent shows, games and prizes which are more appealing to the students.

Another mechanism sought after by DUT on the side of ecological and resources conservation was research. At DUT there were a few explorations being directed identified with natural conservation. From the findings it is bare that Ecotourism division and Horticulture division were occupied with research task of greening networks and propelling green through landscaping by directing exploration that added to natural obligation. DUT showed greening initiative as an instructive establishment committed to tackling some world most squeezing concerns.

Research based interventions could also serve as a keyway of addressing challenges. By conducting formal or informal research could unpack areas of weaknesses and derive alternative solutions. Physical intervention included placing more bins on campus as well as energy saving items such as sensor lights. Based on research findings that instigate that universities are overwhelmed with hunger, the GCI at DUT have initiated One Residence One Garden Initiative. The One Residence One Garden project seeks to alleviate food scarcity and hunger amongst students and also to respond to some of the SDGs that include zero hunger and good health and well-being.

5.3 RECOMMENDATIONS

This study has raised more questions that need to answer through further research. The conservation in the higher institutions of learning is generally under researched in South Africa, so there is little academic literature that gives a broad understanding of GCI. Through the findings, the following recommendations are forwarded.

Based on the findings GCI should consider to be the department on its own with all relevant resources such as financial, human resources and equipment. This is the result of the enormous and delicate duty that it must accomplish. Citing Acuho-I (2019), GCI should formulate educational awareness amongst campus communities about climate

change and capacity building on determining the practical green campus programs that can be commenced at campus level to fight against the impact of climate change. The duties mentioned by Acuho-I requires a well-resourced department to accurately performed. The literature mentioned that GCIs cannot thrive without GCO (Green Campus Office) that expected to operate as an entity separate from the rest of the university operations.

The findings from this study suggested for environmental policy to be aligned to international treaties which South Africa is party to. The internal policy for resources and environmental conservation should be provided. The participants have raised the potential to assist the university in their efforts to establish policies and practices that support campus greening in higher education. The governing policy would improve the probability for accomplishment in execution an extensive sustainability activity on a campus or college grounds. Citing from the literature, the Rhodes University implemented environmental policy, which was amended in September 2015, that policy have successfully regulated the use of energy and water on campus and have minimized carbon footprint, in line with national and international emission reduction targets (Rhodes University, 2015).

Envision 2030 (DUT Strategy 2020-2030) highlights as 3rd of four perspectives – sustainability and stewardship which together address future-orientedness, environmental protection and driving economic progress, collective responsibility, accountability, and custodianship of ‘our planet, our infrastructure, resources and the environment.’ these are aimed at promoting green ecosystems and efficient resource utilisation and living the university values. In my view, envision 2030 does make provision for environmental policies in general and GCI in particular. These need to be actioned and lived by the whole university community.

The findings recommend that portion of green campus initiatives on a university encompasses teaching students. This study has outlined this concept sketchily as incorporating sustainability across the curriculum. As supplementary precise proposals for policy and practice, green campus initiative leaders to enhance environmental education on university could take into account working to involve a sustainability module

or course as component of the main curriculum. Through obliging the entire students to have a minimum of one class where sustainability is the emphasis. Campuses like DUT can possibly give future pioneers the information and abilities expected to address a portion of the basic issues of current and people in the future.

The meaning of financing green campus initiative was referenced as often as possible in the discoveries from this research, just as in the literature. Regardless of whether all difficulties of green grounds activities are survived, the issue of financing can represent the deciding moment the usage of complete environmental sustainability activity. The writing gives understanding into how these activities may be financed citing example such as Harvard's Revolting Loan program, the University of California's the green initiative fund based on student fees (Bardaglio and Putnum, 2009).

As referenced in the discoveries from this study just as in the literature, it can be difficult for green campus initiative leaders to make a solid business case for changing to green. Executing a green economy business can help the university with this test by building up an altered method to reinvest from projects that bring about a net investment funds back into new projects that would save money. In place of looking for funding for each time a new plan is proposed, a recurring stream of funding can be created with the lone objective of financing new programs. On DUT, one example of green economy was through campus recycling of papers and plastics program.

The findings of this show GCI leaders can be immensely supported by partaking in the assessment and evaluation of green campus initiatives in attainment their sustainability targets. There are several means that GCI could utilise to assess its effectiveness that include surveys, green report cards, T- declaration and other forms of assessments. The literature indicates that the ACUHOI SAC establishment has become known as the highly effective assessment platform for campus sustainability (Maistry and McKay 2016). By representing both the manners by which individual campuses are special just as how they are comparative concerning environmental sustainability initiative implementation assessment and evaluation.

This study also recommends that sustainability as one of the perspectives of DUT's new strategy – Envision 2030, is used as a springboard for sustainability policy development.

This policy would have a number of spin-offs, such as the development of a fully-fledged GCI office, which would be tasked with the responsibility to promote environmental sustainability throughout the university, promote GCI in various departments and ensure that the university is fully responsive.

There are some good ideas and future strategies that can contribute to the growth of the initiatives but again, it is dependent on funding, involvement, and support. A mindset, attitudinal and culture change is needed toward GCI. However, the institution has come a long way and is setting a good example for other local institutions to follow. The institution should take it to the next level and try to compete at an international or continental level.

The summary of key research findings of the study will be submitted to the Institutional Research and Innovation Committee (IRIC) and the department of student housing, residence life and presented to relevant academic departments.

5.4 CONTRIBUTION

Most studies have focused on the implementation of Green Campus Initiative in other universities, but not so much emphasis on the fundamental role of GCI along with implementation obstacles and future plans. This study therefore has numerous unique contributions which are wide and immense. It encourages a way of thinking that promotes sustainability in teaching and learning environment.

- The study was able to directly link the triple bottom line and planned behaviour theories, this was a viewpoint that was previously not considered in the past. It pulls together two theories that to promote sustainability and aligned them to work together to evaluate the role of green campus initiative at DUT.

- It contributes to the body of new academic knowledge which will benefit articles on sustainability within higher institutions of learning. This study gives the actual

triumphs, problems, and solutions on GCI of DUT which is the new and unique information that benefits the university.

- In this study it was also discovered that GCI leaders has no powers when it comes decision making on resources and budget allocation. It is catered for by the institution under the department of student housing. This brought about the understanding that the decision on budget amount and which programs are approved for implementation lies with the management of the department thus the reduction of resources and environment exploitation thereof lies with the university.

- Envision 2030 makes room for environmental sustainability and pro-environmental practices in its four perspectives. It is also encouraging to see that all the four perspectives are interlinked meaning that sustainability should go across stewardship, systems and processes, and society to engender efficient practices and sensitize the whole university community on issues of sustainability.

5.5 LIMITATIONS OF THE STUDY

Research study limitations are the characteristics that impact the findings through the design or methodology used on a study such as case study, cross-sectional design. The study was also conducted in 2020 when contact was prohibited due to the COVID-19 pandemic, as such interviews were conducted virtually, questionnaires circulated and collected virtually meaning that the research could not fully engage with the participants. They may be viewed as constrains that may limit the application in practice of the recommendations that are in this study (Miles and Huberman 1994). The study cannot therefore not be generalised to other universities as it was based on DUT. It is a cross-sectional study so it provides a snapshot view of the situation in the Green Campus Initiative movement at DUT. This means that trends could not be identified except in the form of literature review. However, the findings can be adapted to similar situations across the country and globe. The focus of the study is on utilisation of natural environment, electricity, and water resources.

5.6 CONCLUSION

The exploratory examination set out to investigate the degree of conservation, just as the success and pitfall at DUT. It is one of the main investigations to be led that has tried to acquire a comprehension of the preservation proportions of DUT but also raises a need for GCI to raise their standards despite the measures that has been previously implemented. Filho et al. (2017) inferred that there are numerous obstructions that keep GCIs from being exceptional, but this study has recommended strategies that could be adopted to maximum level of conservation using some of the planned behavior and the Triple Bottom Line as underpinning theoretical framework.

The study has shown reasons for the universities to invest on GCI. From the literature Acuho-I (2019), mentioned that GCI interventions should be in a form of formulating awareness amongst campus communities about climate change and capacity building on determining the practical green campus programs that can be commenced at campus level to fight against the impact of climate change.

It is seen in this study that education institutions are establishments that are in good standing to lead the fight for conservation. Yuan et al. (2013) in the literature mentioned that universities in China were required to be in the forefront in promoting conservation. The universities were given the responsibility of inventing initiatives concerning sustainability to breed a resources efficient society, after 2012, UN Conference on Sustainable Development confirmed the leadership role of higher education towards attaining sustainable development, then GCI were consolidated (United Nations 2012). GCI has influenced number of universities counting Tokyo university to use renewable energy bases such as solar photovoltaic (PV) power as a possible resolution for dropping the air pollution without compromising the functionality of campuses (Teah et al. 2019).

The study has mentioned that GCI serves as the platform where means are taken to drive sustainability withing universities. In this study it is outlined are taken. The GCI has mandate were to assist universities and their campuses to avoid exploiting resources through there be mindful towards exploitation resources through offering education activities regarding environmental sustainability and influence on societies through community engagements. Writers such as Aleixo et al. (2018) on literature indicated

GCIs broad impression, is to encourage the administration of campus sustainability operations to operate sparingly. GCIs included the design of campuses for energy efficiency, management of green buildings, energy, water, food, transportation, purchasing, waste, and sustainable landscaping (Rwelamila and Purushottam 2015: 368).

The investigation was important as it contributed to fining solutions for heightening worldwide environmental issues and since realization that the expenses of inaction to battle environmental change are even higher (Gao 2017). This study has covered basic task carried out by universities to fight against environmental and resources over-use. It empowers several people that include alumni, students, staff, and surrounding communities to achieve such ascribes to being ecologically and socially mindful of conservation inside neighborhood and worldwide settings.

The study suggested that GCI at DUT can be improved by incorporating the theory of planned behavior and the theory of triple bottom line. This approach helped by linking the movement with significant aspects that included considering economic, social, and environmental, this are the crucial elements that evolved around achieving environmental sustainability. Mafongosi (2018) suggested that the used of theories is important as it would help GCI members in improving their skills and broadening their knowledge regarding sustainable development.

The study findings displayed in chapter four and recommendations in chapter five are important to inform direction on how to improve the implementation of GCI at DUT. It has suggested that all stakeholders to be part of green campus initiative to be come up with the joint strategy. The outcomes of studies reviewed in literature and those derived from this study would be helpful to green campus initiative frontrunners looking to green their universities.

5.7 AREAS FOR FURTHER RESEARCH

The areas of future research are based on the findings and the research limitations of time and resources. The study could not cover all aspects of green campus initiative thus

left more questions for future investigation. This study focuses on the role of Green Campus Initiative (GCI) as integral for environmental and sustainable resources utilisation. The questions were answered however more questions arose during the study. The natural direction for future studies on this topic is to study the following:

- A study to investigate why the majority of students do not form part Green Campus Initiative movement at DUT.
- A study to investigate how DUT could go about in infusing GCI across the curriculum.
- A study to assess the relationship of GCI with fourth industrial revolution in South African universities.
- Investigating the associated cost of establishing, marketing and sustaining a GCI department at DUT.

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APPENDICES

APPENDIX A

IREC LETTER

Institutional Research Ethics Committee
Research and Postgraduate Support Directorate
2nd Floor, Berwyn Court
Gate 1, Steve Biko Campus
Durban University of Technology

P O Box 1334, Durban, South Africa, 4001

Tel: 031 373 2375
Email: lavishad@dut.ac.za
http://www.dut.ac.za/research/institutional_research_ethics

www.dut.ac.za

20 October 2020

Mr H S Shange
1624 Imbali unit BB
Pietermaritzburg
3201

Dear Mr Shange

The role of Green Campus Initiative (GCI) as integral part of environmental and sustainable resources utilisation: A case of Durban University of Technology.

I am pleased to inform you that **PROVISIONAL APPROVAL** has been granted to your proposal subject to:

- Obtaining and submitting the necessary gatekeeper permission/s to Institutional Research Ethics Committee (IREC).

PLEASE NOTE THAT THIS IS NOT A FINAL APPROVAL LETTER. KINDLY SUBMIT THE ABOVE MENTIONED DOCUMENTS WITHIN THREE MONTHS TO THE IREC OFFICE. DATA COLLECTION CAN ONLY COMMENCE WHEN IREC ISSUES FULL APPROVAL

The Proposal has been allocated the following Ethical Clearance number **IREC 056/20**. Please use this number in all communication with this office.

Approval has been granted for a period of **ONE YEAR**, before the expiry of which you are required to apply for safety monitoring and annual recertification. Please use the Safety Monitoring and Annual Recertification Report form which can be found in the Standard Operating Procedures [SOP's] of the IREC. This form must be submitted to the IREC at least 3 months before the ethics approval for the study expires.

Yours Sincerely

Professor J K Adam
Chairperson: IREC

APPENDIX B

GATEKEEPER'S LETTER

Directorate for Research and Postgraduate Support
Durban University of Technology
Tromso Annexe, Steve Biko Campus
P.O. Box 1334, Durban 4000
Tel.: 031-3732576/7
Fax: 031-3732948

21st October 2020
Mr Hlanganani S. Shange
c/o Department of Ecotourism
Faculty of Management Sciences
Durban University of Technology

Dear Mr Shange

PERMISSION TO CONDUCT RESEARCH AT THE DUT

Your email correspondence in respect of the above refers. I am pleased to inform you that the Institutional Research and Innovation Committee (IRIC) has granted **Full Permission** for you to conduct your research "The role of Green Campus Initiative (GCI) as integral part of environmental and sustainable resources utilisation: A case study of Durban University of Technology" at the Durban University of Technology.

The DUT may impose any other condition it deems appropriate in the circumstances having regard to nature and extent of access to and use of information requested.

We would be grateful if a summary of your key research findings would be submitted to the IRIC on completion of your studies.

Kindest regards.
Yours sincerely

DR LINDA ZIKHONA LINGANISO
DIRECTOR: RESEARCH AND POSTGRADUATE SUPPORT DIRECTORATE

APPENDIX C

INFORMATION LETTER TO RESPONDENTS

LETTER OF INFORMATION

Title of the Research Study: Role of Green Campus Initiative as integral part of Durban University of Technology environmental and sustainable resources utilisation.

Principal Investigator/s/researcher: HS, Shange, have honors in Tourism Management.

Co-Investigator/s/supervisor/s: Dr DC Hlengwa, holds Doctorate in Business Administration

Brief Introduction and Purpose of the Study:

I am Hlanganani Shange a master's student at Durban University of Technology under faculty of management sciences. I kindly invite you to participate in the study by the means of being the interviewee. The researcher seeks to analyze the role of (GCI) as conservation tool in Durban University of Technology, describing, analysing and strengthening the effects of (GCI) in resources usage and environmental education in (DUT).

Outline of the Procedures:

The data collection process will take place in two locations, Durban and Midlands DUT campuses. the Student housing department meeting room will be booked from DUT facilities authorities for both Durban sessions and Pietermaritzburg sessions. The date and time data collection will differ for due to the setting of the study. Same interview questions and questioners will be used in both occasions. The interviews schedules will take maximum of 15 minutes per session and questionnaires administration is expected to take maximum of 10 minutes per session. The interviews schedules apply to GCI coordinator office barriers and Student Housing department Residence Life Office barriers and questionnaires will be targeted to GCI membership (students). This process will be conducted in a quiet to avoid distractions. The audio recorder will be used during interviews sessions to capture the sessions. The recorded interviews data will be named by codes and stored in a memory stick. Answered questionnaires and memory stick will be kept in supervisor's office to protected respondent's privacy.

Inclusive criteria

- Durban University of Technology registered student.
- Students who are Green Campus Initiative members.
- Durban University of Technology Student housing department residence life officers.
- Durban University of Technology Green Campus Initiatives coordinating officers.

Exclusive criteria

- Durban University of Technology unregistered students.
- Students who are Non-Green Campus Initiative members

The predetermined outputs of the study are the publication of research findings, the findings of this research will assist (GCI) management team with recommendation of conservation strategies that will advance minimal usage of electricity, water and natural environment. The research paper will be presented in conferences.

Risks or Discomforts to the Participant:

No risks to be imposed towards the participants, you will be given permission at any time you wish to withdraw from the study.

Reason/s why the Participant May Be Withdrawn from the Study:

None

Remuneration: You will not receive any remuneration for participating in the study.

Costs of the Study: There will be no costs to you as all the costs will be borne by the researcher.

Confidentiality: Participants interview data will be named using codes, will be stored safely and will be used only for the purpose of the study.

Research-related Injury: There will be no anticipated injury.

Storage: The interview transcripts and answered questionnaires will stored in supervisor's office, inside a lockable shelf designed to store research data. I and my supervisor we will be only will have access.

Persons to Contact in the Event of Any Problems or Queries:

Please contact the researcher (Tel no.0738365232 or 21556095@dut4life.ac.za), my supervisor Dr DC Hlengwa, 0338458858, dumisileh@dut.ac.za or the Institutional Research Ethics administrator on 031 373 2375. Complaints can be reported to the DVC: RIE, Prof S. Moyo on 031 373 2576 or dvcrie@dut.ac.za

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APPENDIX D

INTERVIEW GUIDE

1. Kindly inform me about your position at DUT and involvement with GCI.

   ---

2. How long have you been involved with GCI at DUT?

   ---

3. In your understanding, which are the campuses that participate in GCI at DUT?

   ---

4. How many staff members and students participate actively in GCI?

   4.1 Comment on the nature of participation.

   ---

5. What are the policies that are in place to enforce conservation at DUT?

   ---

6. In your understanding, what is the stance of the Executive Management of GCI matters at DUT?

   ---

7. What are the initiatives taken to capacitate university stakeholders about conservation?

---

8. Is (GCI) involved in protection of plants within the university? Please explain.

---

9. What is done so far to conserve water and electricity within DUT?

---

10. What has been done so far to conserve energy/electricity at DUT?

---

11. What are the challenges faced by GCI at DUT?

---

12. What is being done/can be done to overcome these challenges?

---

13. Kindly comment on the future of CGI at DUT.

---

14. Do you have any comments or questions relating to this study?

Thank you for your participation.

APPENDIX E

QUESTIONNAIRE

You are requested to kindly complete the questionnaire by writing your responses in the space provided below the questions:

1. What age group do you belong to?

18+		39+		40+		65+

2. How long have you been involved with GCI?

---

3. Kindly elaborate on your involvement with GCI.

---

4. What GCI and what is your experience about it?

---

5. How do you think we can improve people's attitude about throwing litter on the floor/recycling paper?

---

6. What initiatives do you in place to reduce overuse of water and electricity in campuses and residences?

---

7. Explain in detail, how do you evaluate its effectiveness?

---

8. What have been your major challenges implementing GCI so far?

---

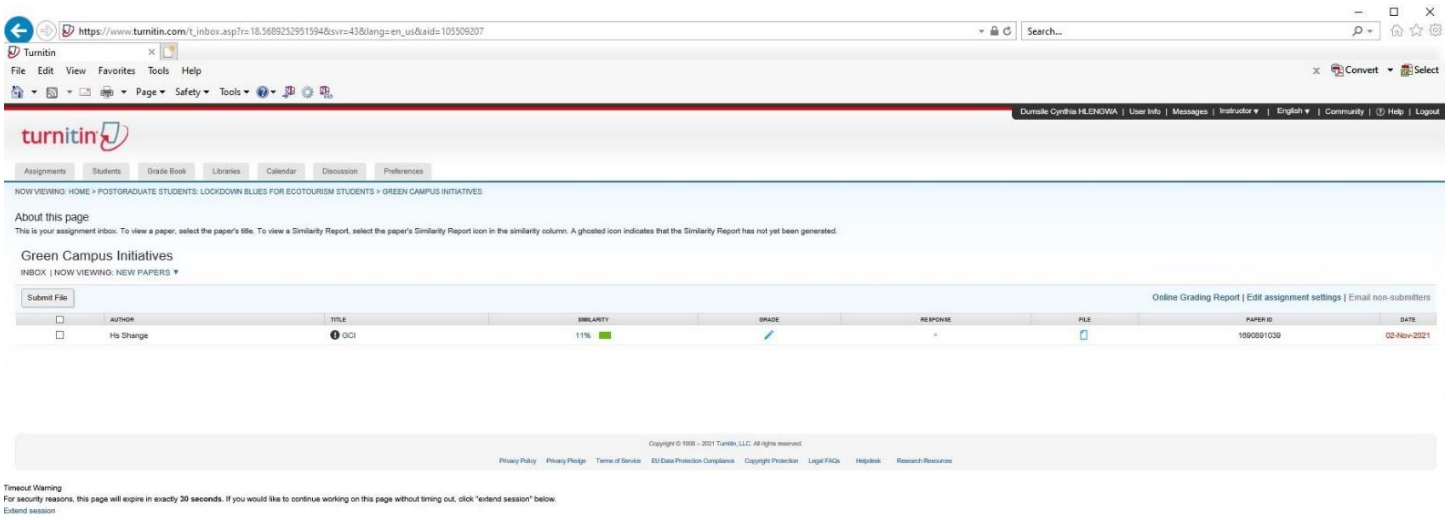
9. What strategies have been put in place to deal with these challenges?

---

10. Kindly comment on what you think is the future of GCI at DUT.

APPENDIX F

TURNITIN REPORT



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