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Green entrepreneurship's role in resolving Green Campus Initiatives challenges in higher education

Authors:
Hlanganani S. Shange[1]
Emmanuel Lawa[1]
Bongani I. Dlamini[1]

Affiliations:
[1]Department of Applied Management, Faculty of Management Sciences, Durban University of Technology, Pietermaritzburg, South Africa

Corresponding author:
Hlanganani Shange,
hlanganinis@dut.ac.za

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Orientation: This study critically evaluates the Green Campus Initiative's (GCI) efficacy in promoting Sustainable Development Goals (SDGs) within universities, noting limited contributions despite attention.

Research purpose: The investigation aims to identify and address challenges hindering GCI implementation in universities. The study recognizes GCI's pivotal role in mitigating environmental degradation and global warming, impacting economic growth.

Motivation for the study: The motivation stems from the urgent need to combat environmental challenges, prompting a thorough examination of GCI's effectiveness in universities to devise solutions for sustainable development.

Research design: Employing a qualitative research design, the study analyzes GCI challenges in higher education. Purposive sampling selects 61 participants from a GCI membership of 150, ensuring a comprehensive understanding of the issues.

Approach and method: This research study employed a qualitative research approach, utilising purposive sampling to select respondents who met specific criteria. The study included 61 participants who met the inclusion criteria out of a population of 150 GCI members.

Main findings: The research highlights GCI challenges, encompassing staff shortages, limited resources, inadequate equipment, organizational gaps, and insufficient working spaces. Recommendations emphasize transformative measures and innovative solutions to address these impediments.

Practical/managerial implications: Addressing GCI challenges is imperative for successful sustainable development strategies in universities. Practical solutions are essential to overcome resource constraints, fostering an environment conducive to GCI effectiveness.

Contribution/value-add: This study not only provides practical evidence for GCI implementation in higher education but also contributes to existing literature by identifying and analyzing challenges within universities. Moreover, it presents recommendations for financial regenerating strategies to augment GCI's impact on sustainable development, enriching scholarly discourse in the field.

Keywords: green campus initiative; green entrepreneurship; sustainable development; challenges; student housing; leadership; environmental sustainability; innovation.

Introduction

Environmental degradation caused by increasing population and high resource usage has resulted in global warming, natural disasters, and rising sea levels (Fonseca, Moura & De Almeida 2018). The adverse effects of these activities have negative impacts on economic growth, leading to unemployment, inflation, and reduced government subsidies for higher learning institutions (Ting, Bin & Weng Wai Choong 2012). Thondhlana and Hlatshwayo (2018) argue that these problems stem from daily human economic activities. To combat this issue, the Green Campus Initiative (GCI) was established as a sustainable development strategy for higher learning institutions (Isa et al. 2021). Despite various institutions implementing sustainable development initiatives, they encounter challenges hindering their effectiveness, such as a lack of adaptability, insufficient finances, and poor relationships with sustainable organisations such as waste businesses (Benjamin et al. 2018).

The objectives of this study were to examine the challenges in implementing the GCI in universities and recommend solutions to tackle them. Specifically, the study aimed to provide strategies for promoting sustainability in the context of GCI at institutions of higher learning. A qualitative approach was used to achieve the objectives.

This article contributes to literature on GCI by exploring the concept of green entrepreneurship as it relates to GCI. We also contribute by identifying challenges and recommending financial regenerating strategies and providing practical evidence for facilitating the implementation of GCI. The rationale behind linking green entrepreneurship and GCI stems from prior studies having shown its relevance in addressing financial problems encountered by institutions of higher learning (Febrega 2018; Ivanovici & Baber 2022). Further, the investigation is aligned with the United Nations' (UN) Sustainable Development Goals (SDGs), particularly goals 13, 14, and 15, to fight climate change and protect life below water and on land (Weber 2017; United Nations 2022). It also contributes to the advocacy of sustainable patterns of development and consumption as a means to achieve environmental, social, and economic prosperity (Anderson et al. 2017).

Literature review

The literature on sustainability can be broad. To bring focus and context for the current article, the following sections review and discuss concepts such as green entrepreneurship and sustainability, the significance of GCI, and challenges of implementing GCI.

Green entrepreneurship and sustainable development

The concept of the 'green economy' has emerged as a means to achieve social equality and human development while minimising environmental impact (UNEP 2011). It aims to reduce pollution and waste, increase the efficiency of resource and energy consumption, and promote growth and prosperity while ensuring the sustainable use of natural resources (International Chamber of Commerce 2012). A recent study by Alvarez-Risco et al. (2021) explored the role of education in supporting green entrepreneurship among students in a university in Peru. Using a quantitative approach through online surveys, the study found that students' personality traits were positively and significantly associated with green entrepreneurial intention, but risk-averse students depicted insignificant results towards green entrepreneurial intention.

In the late 1980s and early 1990s, the UN organisations introduced new conceptual perspectives on society and economy, with sustainable development emerging as a significant theory. The United Nations Conference on Sustainable Development, held in Rio de Janeiro in 2012, marked a pivotal moment in the shift from a traditional model of development to a sustainable development model. The conference resulted in the adoption of five papers, including 'The Rio Declaration on Environment' and 'Agenda 21'. The latter calls for national programmes for sustainable development – Local Agenda 21 – to be implemented by governments worldwide (Lavrinenko et al. 2019).

Sustainable development is a continual process of meeting the demands of current and future generations, with the economic, social, and ecological aspects interdependent and interconnected (Ohotina et al. 2018; Rosha & Lace 2015). While the definition of sustainable development is widely accepted, there is still ongoing debate on the methods for implementing it (Lavrinenko et al. 2019). The concept of sustainable development is viewed from two angles, with a focus on the environmental aspect in a restricted sense, and as a new form of civilisational functioning in a broader sense. As a result, sustainable development has become an objective demand of the current era.

Proper development is a subset of sustainable development that focusses on the rationalisation for the stability of popular development objectives, including resource, social, economic, environmental, legal, and cultural aspects, in a specific organisation aligned with sector-specific, local, and national development preferences. Governance of sustainable development, based on the process approach, is a collection of approaches, methods, and processes that offer a qualitative alteration of the system under the circumstances of evolutionary operating. Sustainable development is a modern method of production and economic system (community, organisation, industry, etc.) that allows for long-term strategic advantages (Kozhevina 2015).

Regarding the South African context, sustainable development has been identified as a primary goal, and the green economy is viewed as a route to achieving it (Sustainable Development 2008). The South African government and other stakeholders have invested in supporting the notion of the green economy by providing sufficient resources for programme implementation.

The significance of Green Campus Initiatives

Sustainability, as defined by Holzbaur, Jordaan and Wenzel (2013), is a challenging goal because of population growth and assisted development that exacerbate the strain on financial resources (Tiyarattanachai & Hollmann 2016). Aleixo, Leal and Azeiteiro (2018) assert that sustainability is a balance of economic, social, and environmental factors, and is linked to the preservation and protection of resources for future generations. The Stockholm Declaration of 1972 addressed sustainability in university education, focussing on ways for universities, their authorities, lecturers, scholars, and students to address the challenge of reconciling human pursuit of technical and economic progress with nature conservation (Tiyarattanachai & Hollmann 2016).

According to Genta et al. (2019), education can be a potential solution to overharvesting of resources through conservation measures and entrepreneurship. Fonseca et al. (2018) and Hosna (2014) define a 'Green Campus Initiative' as one that creates and maintains conditions for people and nature to coexist harmoniously, while also achieving social, economic, and environmental objectives. Isa et al. (2021) describe a 'Green Campus Initiative' as one that promotes environmental sustainability by reducing harmful effects on human health and environmental pollution. Ragazzi and Ghidini (2017) further emphasise that university should leverage its resources and expertise to impart knowledge, conduct research, and practise stewardship in ways that help the public adopt a green lifestyle.

The GCI is a conservation mechanism that has gained global prominence in all institutions of higher learning and has made remarkable contributions towards reducing environmental exploitation and resource consumption (Alberts et al. 2016). Li, Tan and Raches (2015) argue that campus sustainability efforts have captured the attention of the UN high-level government committee. This is because of the notable innovations introduced by the GCI, such as carbon-free photovoltaic (PV) power generation systems implemented in Tokyo universities (Teah, Yang & Onuki 2019). However, translating university corporate strategy into a green campus project strategy through process alone is impossible (Morris & Jamieson 2004). Implementing strategy into practices and procedures requires a wide range of individual competencies and knowledge (Hornby & Thomas 1989), as well as a clear definition of roles, responsibilities, and accountability both within higher education institutions (HEIs) and between academic and non-academic employees.

Durban University of Technology's green campus initiatives

The Durban University of Technology (DUT) has been recognised as one of the world's greenest universities (Ndlovu 2019:4). In 2012, DUT launched its GCI with the aim of creating an ecologically sustainable campus (Motha 2013). The DUT GCI is led by the Department of Student Housing, which is managed by Residence Life as a student-led initiative (Makhuba 2018). The primary goals of the DUT GCI, as outlined by Acuho-I (2019), include reducing high water and energy consumption, promoting environmental sustainability on campus and at DUT residences, reducing waste through recycling, promoting cleanliness, redirecting waste landfills, and encouraging students to practise recycling on campus.

Despite its successes, the DUT GCI faces several obstacles. Maistry and McKay (2016) note that South African institutions must overcome internal constraints such as a lack of research on energy efficiency in their programmes. Legislation such as the *South African Environment Management Act (No. 46 of 2003)* and the *National Water Act No. 36 of 1998* regulate the protection of South Africa's natural environment and the preservation, development, conservation, management, and control of the country's water resources. These laws serve as the basis for the formulation of institutional internal policies that protect the environment and water resources at universities. These policies are linked to the triple bottom line by advocating for the balance between environmental conservation and economic generation. They strive to change environmental behaviour by educating people about the need for environmental conservation and enforcing it through fines when necessary.

The DUT GCI is just one example of a broader phenomenon of GCI at universities worldwide. Green campus initiatives aim to empower students by meeting their enthusiasm and commitment to long-term change with sufficient support and funding. They create engagement platforms that boost innovation and entrepreneurship through cooperation and partnership (ACUHOI SAC 2016).

Challenges of implementing Green Campus Initiative

The concept of a 'green campus' involves a community working together to maintain resources, increase environmental quality, and improve energy efficiency (Noor, Loong & Naamandadin 2019). However, the implementation of sustainable initiatives on campuses faces various challenges, including a lack of environmental education and awareness (Noor et al. 2019:110–113), high consumption patterns (Tung Ha 2019; Tiyarattanachai & Hollmann 2016), insufficient funding (Isa et al. 2021; Finlay, Massey & Massey 2022), and a shortage of green product providers and sustainability indicators.

Glazewski and Esterhuyse (2016) have pointed out that sustainability challenges are global, and environmental quality is worsening in the southern African region. Pantaleo, Rwelamila & Purushottam (2015) have found that many universities are struggling to combat sustainability issues through various means such as curricula, services, research, and practice. Arroyo (2017) has identified the most common challenges to implementing sustainability initiatives, including a lack of financial resources, motivation, and policies.

According to Katiliūtė, Stankevičiūtė and Daunorienė (2017), universities may not be able to fully commit to sustainability projects because of inadequate budgets. Isa et al. (2021) have also highlighted that the main obstacle institutions face when implementing Green Campus projects and programmes is a lack of funding. However, some universities have started engaging in entrepreneurship activities to overcome financial challenges, such as the partnership between the Universiti Teknologi MARA (UITM) Perak University and the Federal Agricultural Marketing Authority in Malaysia for green entrepreneurship (Isa et al. 2021).

Isa et al. (2021) have conducted a qualitative study on strategies, challenges, and solutions for implementing Green Campus at UITM Perak University, revealing that financial, awareness, and knowledge-related challenges hinder the full implementation of conservation initiatives. To overcome

these challenges, universities must take several actions towards attaining sustainable development. Ivanovici and Baber (2022) have also found that campus sustainability and environmental sustainability influence students' entrepreneurship for sustainability, and the link between them is mediated by attitude towards sustainability.

In conclusion, the implementation of GCI faces various challenges that must be addressed to attain sustainable development. Universities must take multiple actions, including enhancing environmental education and awareness, seeking financial support, and engaging in entrepreneurship activities. Campus sustainability and environmental sustainability also play a significant role in shaping goals for sustainable entrepreneurship among universities, students, researchers, and curriculum makers.

Reasearch methods and design

For this study, a qualitative research methodology was employed in accordance with the work of Isa et al. (2021) who ran a similar study in the context of Malaysia. In our research, we used purposive sampling to select respondents who met the inclusion criteria. The inclusion criteria were: (1) senior registered students at the DUT, (2) members of the GCI, and (3) employees of the student housing department at the DUT. Seasoned GCI members, student housing Residence life development officers, and GCI practitioners were deemed appropriate candidates for this study, and they contributed to effective data triangulation. The use of these various data sources helped to gain a comprehensive understanding of green entrepreneurship as it relates to the financial challenges of GCI.

To determine the appropriate sample size for the study, we followed Singh and Masuku (2014:11) who suggest that a sample size of 91 respondents in a population of 1000 would yield a 95% confidence level in the results with a 10% precision level. In the present study, the sample was 61 people who met the inclusion criteria out of a population of 150 GCI members from the 2020 DUT GCI annual database. Of the 61 participants, 2 were GCI practitioners, 1 was a student residence life officer, and 58 were GCI members. The participants were recruited via email, which was sent to them through the leadership structures of the University's department of student housing. Data collection was done using interviews and qualitative questionnaires. Green Campus Initiative practitioners and residence life development officers were interviewed remotely using Microsoft Teams, while data from student GCI membership were gathered using qualitative questionnaires administered virtually through Google Forms. Maureen et al. (2020) have previously used virtual interview data collection methods. The qualitative questionnaire used in this study was previously utilised by Hlengwa and Shange (2021), and was deemed adequate to elicit information to fulfil the research objectives.

Data collected from the interviews were manually analysed because of the small number of interviewees, data were collected through interviews involving three participants, consisting of two Green Campus Initiative (GCI) practitioners and one student residence life officer. Due to the limited number of interviewees, a manual analysis of the interviews was conducted. The data obtained from the broader GCI membership at the Durban University of Technology (DUT) underwent a thematic analysis using Nvivo 12 software. To elicit comprehensive insights, qualitative questionnaires were administered to GCI members from all seven DUT campuses, including Steve Biko Campus, City Campus, Ritson Campus, ML Sultan, Brickfield Campus, Indumiso Campus, and Riverside Campus. NVivo 12 was also used for analysis. Data were analysed using cluster analysis generated by NVivo to illustrate the key words in the form of bubbles. Hierarchical charts were also used to identify the volume or concentration of responses in themed areas. Word cloud was used to indicate the higher frequency of words and their relationship to each other. All these methods aided in providing a comprehensive understanding of the challenges of implementing GCI in universities and identifying potential remedies.

Ethical considerations

An application for full ethical approval was made to the Durban University of Technology, Institutional Research and Innovation Committee and ethics consent was received on 21 October 2020. The ethics approval number is IREC 056/20.

Results

Green Campus Initiatives represent a crucial endeavour in HEIs, seeking to integrate sustainability and environmental consciousness into the fabric of campus life. However, the implementation of GCI projects is far from straightforward, as they often encounter formidable challenges. This discussion delves into the multifaceted landscape of GCI implementation challenges, offering critical insights into the hurdles faced by these sustainability-driven initiatives.

Green Campus Initiative implementation challenges

Figure 1 highlights the main themes that emerged from the challenges faced by GCI at DUT. It depicts that the challenges experienced by GCI were inadequate resources, no proper GCI structure, no specific policy, and insufficient knowledge. The implementation of GCI is an add-on to existing systems rather than a revolutionary paradigm shift. The finance and resources were found to be an effect of the lack of financial sponsorship from the institution's management. The lack of dedication and commitment to GCI was also a challenge highlighted by many respondents. The challenges faced in implementing GCI had a coverage of 20.56%, with eight references indicating that the lack of commitment from the university community was also a challenge. These findings are concurring with the findings of study of Pantaleo et al. (2015) on GCI as projects that

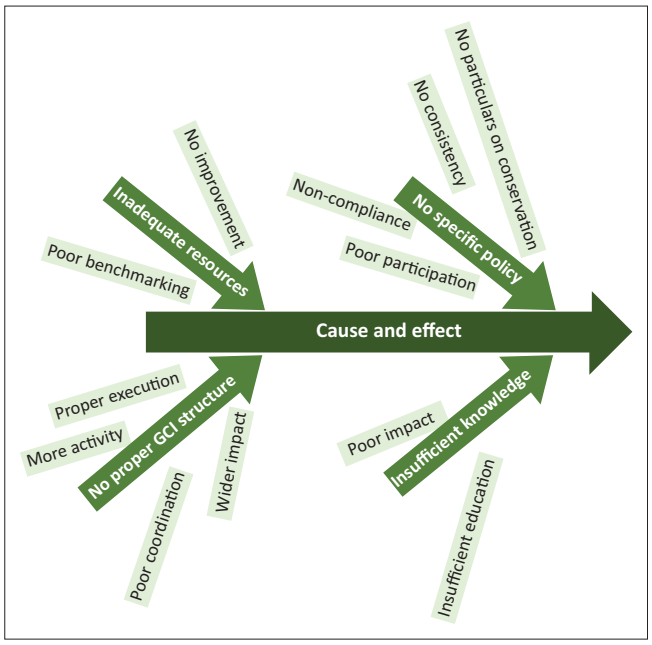

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FIGURE 1: Challenges faced by green campus initiatives at Durban University of Technology.

revealed finances as the major challenge affecting GCI. Furthermore, the results are in line with those of research done by Isa et al. (2021), which discovered that a lack of funds was the biggest obstacle to applying for a green campus. Their findings indicate that the expense of creating a green campus is relatively high.

Policies for enforcing Green Campus Initiatives projects

The interview results suggest that there is some uncertainty about the specific policies that regulate conservation in DUT. Respondent 1 indicates that there are no specific policies in place, while respondent 2 suggests that there may be international, national, and local regulations that are cascaded down to the university, but they may be fragmented or not well-known. Respondent 3 highlights the existence of structures within student housing forum and other structures under student housing that have policies to back up their existence, suggesting that there may be some formal support for GCI projects, but it may be nested within larger institutional policies and not specifically tailored to GCI.

The study findings are similar to those conducted by Mafongosi, Awuzie and Talukhaba (2018). Mafongosi, Awuzie, and Talukhaba (2018) suggest that, while many universities in developing countries have made efforts to implement sustainable practices, there is a lack of comprehensive Green Campus Initiative (GCI) policies in place. This deficiency hinders the effective integration of sustainable development strategies within the academic framework, emphasizing the need for robust GCI policies to address environmental challenges in these regions.

Overall, the interview data suggest that there may be a lack of clear and comprehensive policies that directly support GCI projects financially. However, there may be some regulatory and institutional structures in place that provide indirect support. To promote adequate budgets for GCI projects, it may be necessary to advocate for more explicit financial incentives and support for GCI. Additionally, it may be important to identify and address any finance-related challenges that may be hindering the success of GCI projects in HEIs.

The research findings, as elucidated in Figure 2, provide critical insights into the formidable financial and funding challenges encountered in the execution of GCI within HEIs. Figure 2 serves as a pivotal reference point for understanding the intricate landscape of financial obstacles faced by GCI projects.

The study unequivocally reveals that finance and resources emerge as the foremost challenges confronting GCI projects. This overarching issue looms large, casting a shadow over the successful execution of sustainable initiatives on university campuses. The overarching prominence of financial barriers underscores the critical need for strategic solutions to navigate this landscape.

One of the most conspicuous findings unveiled in Figure 2 is the stark absence of financial assistance from the institution's administration. This glaring void in support from the upper echelons of the university hierarchy represents a significant impediment to the realisation of GCI projects. The absence of financial backing from institutional leadership underscores the pivotal role such support plays in propelling sustainable initiatives forward.

Notably, finance-related challenges exhibit the highest coverage among the array of obstacles encountered in GCI implementation. This ubiquity underscores the far-reaching and pervasive nature of financial constraints within the GCI project landscape. These financial challenges permeate various facets of GCI projects, from their initial conceptualisation to their practical execution. The prevalence of financial obstacles within this context mirrors the broader challenges encountered by sustainability initiatives in higher education.

Strategies to overcome mentioned challenges

The GCI at DUT faces financial challenges that the participants identified and suggested solutions for. These solutions include collaboration with academic departments, fundraising, and seeking sponsorships, as well as the use of edutainment to maintain public interest. However, there are still challenges such as the need for adequate funding, the lack of trash bins, and the need to develop new ways to maintain sustainable campuses. The proposed solutions had low coverage rates, but the innovative thinking is encouraging. It is important to ensure the long-term viability of the initiatives for sustainability and their impact in the long run, and these insights provide valuable information for promoting sustainable and eco-friendly initiatives in HEIs,

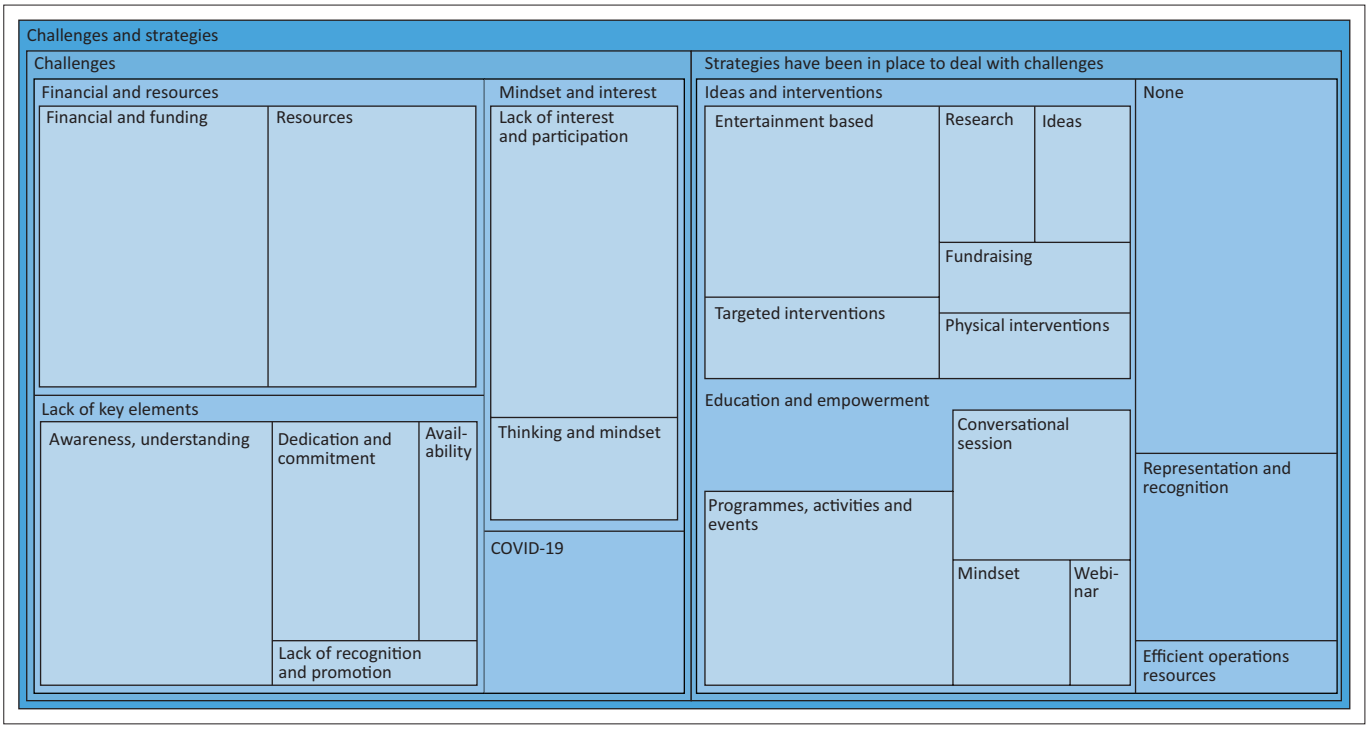

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FIGURE 2: Finance and funding challenges in Green Campus Initiatives implementation.

informing policy and decision-making processes. The findings of the study corroborate those of the study by Filho et al. (2017) that proposed several strategies for overcoming these barriers, including leveraging existing resources, partnering with other organisations, and implementing innovative financing models such as green entrepreneurship.

Figure 3 serves as a comprehensive visual representation of the strategies proposed by participants to address the multifaceted challenges encountered within the GCI at DUT. The Figure encapsulates diverse and innovative approaches advocated by participants, shedding light on potential pathways towards enhancing the sustainability and competitiveness of GCI projects. A thorough analysis of Figure 3, in conjunction with research findings, is imperative to garner a deeper understanding of these strategies.

One notable strategy depicted in Figure 3, inspired by research conducted in Serbia, Portugal, and Brazil by Graham, Rupp and Brungard (2021), advocates for a transition to renewable energy sources. This shift aligns with broader sustainability goals and can enhance the competitiveness of GCI projects by reducing environmental impact and long-term costs. Similarly, the strategy proposed by Graham et al. (2021) highlights the significance of improving the business environment to support a sustainable and competitive industry. A conducive business environment can facilitate the development and growth of eco-friendly initiatives within HEIs.

Participants emphasised the empowerment potential of research collaboration with academic departments. This strategy leverages the expertise and knowledge within the academic community to generate alternative solutions and innovations for GCI challenges. The figure reflects the dual approach to funding GCI projects. While participants ideally advocate for institutional funding, they also acknowledge the feasibility of self-generated fundraising. This duality recognises the importance of diverse funding mechanisms to ensure financial sustainability.

Edutainment, highlighted within Figure 3, emerges as a core element to sustain interest in the GCI movement. This approach combines education and entertainment to engage and educate stakeholders, thereby fostering lasting commitment to GCI principles. The strategies presented in Figure 3 collectively exhibit an impressive coverage rate of 80%. This indicates a strong consensus among participants regarding the importance of these strategies in addressing GCI challenges.

The Figure further elucidates six key strategy references that encapsulate the multifaceted approach to overcoming GCI challenges. These references emphasise the need for engaging activities, seeking sponsorships, enhancing waste management (more litter bins), strong GCI leadership for fundraising, innovative methods for campus sustainability, and active student engagement.

Discussion

The implementation of GCI at DUT presents a series of substantial challenges, as demonstrated by the research findings discussed in this section. These challenges

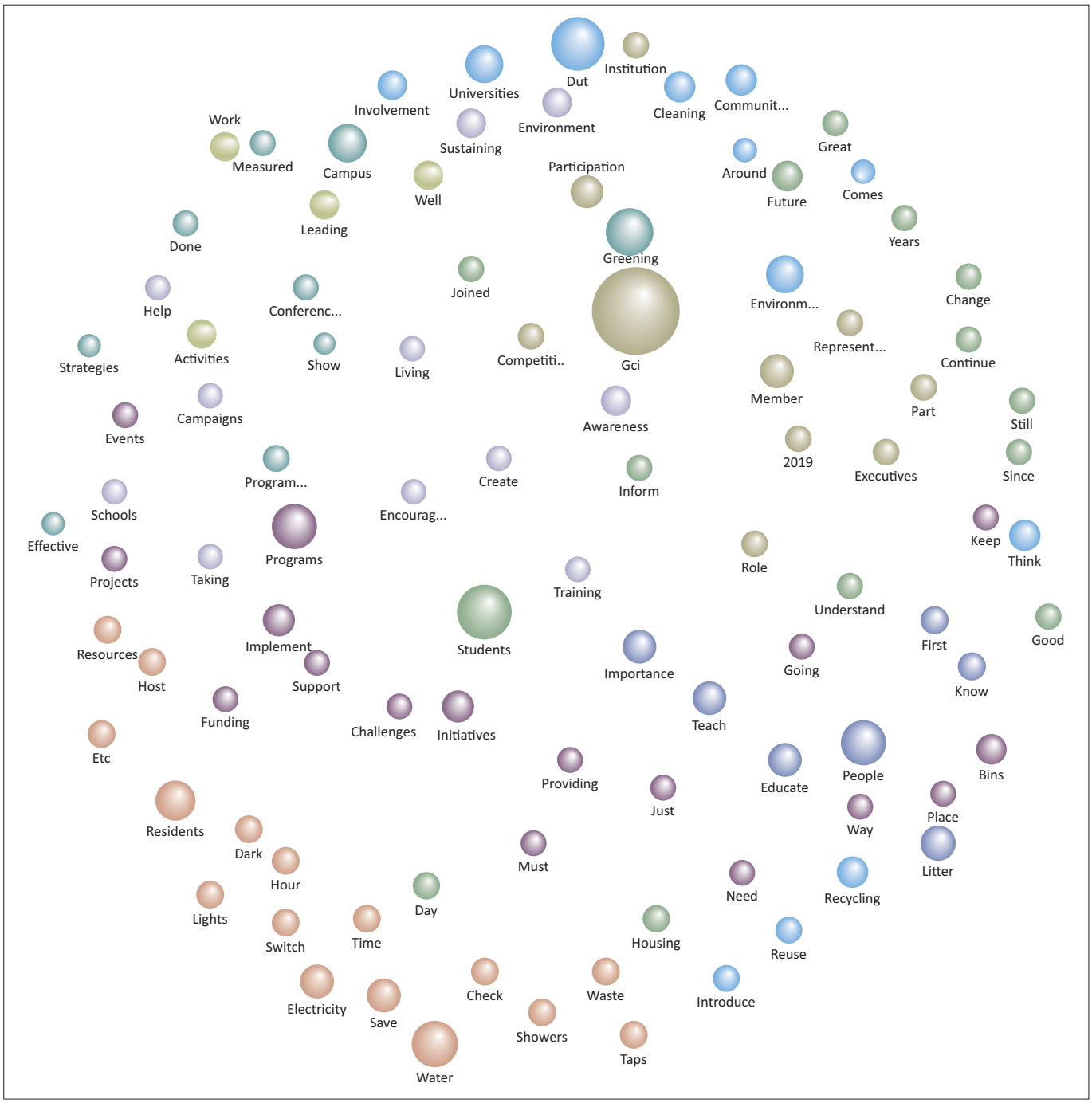

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FIGURE 3: Strategies to overcome Green Campus Initiatives challenges.

predominantly revolve around the perception of GCI as an auxiliary addition to existing systems, rather than a transformative shift in paradigm (Figure 1). Notably, the most pressing challenge identified by study participants is the constraint of finance and resources, which can be traced back to the absence of financial sponsorship from the institution's management. Additionally, the deficiency of dedication and commitment to GCI within the university community emerges as a significant hurdle.

These findings resonate with prior research, particularly the work of Pantaleo et al. (2015), which also underscored finances as a pivotal obstacle impacting GCI projects. A similar challenge was unveiled by Isa et al. (2021), who identified a lack of funds as a primary impediment to establishing green campuses. Consequently, it becomes evident that financial constraints represent a recurring barrier to GCI implementation across HEIs.

In the realm of policies governing GCI projects, the study reveals a degree of uncertainty regarding the existence and clarity of specific regulations at DUT. Respondents offered varying perspectives, with some indicating the absence of well-defined policies and others alluding to potential but

fragmented regulations. These findings are congruent with the research conducted by Mafongosi et al. (2018), which emphasised the dearth of comprehensive GCI policies, particularly in developing nations.

The findings also suggest that there exists a deficiency in explicit and comprehensive policies that provide financial support for GCI projects. Addressing this void necessitates advocacy for more transparent financial incentives and backing for GCI. Furthermore, it is crucial to focus efforts on recognising and tackling finance-related challenges that obstruct the success of GCI projects in HEIs.

Figure 2 reinforces the prominence of financial and resource-related challenges as the most formidable impediments to GCI implementation. The lack of financial backing from the institution's administration emerges as a major obstacle, underscoring the pivotal role of financial support in advancing GCI. The study also underscores the significance of enhancing awareness and commitment to GCI within the academic community to surmount these challenges.

The discussion extends to strategies designed to surmount these challenges, identifying potential solutions such as collaborative efforts with academic departments, fundraising initiatives, pursuit of sponsorships, and leveraging edutainment to sustain public interest in GCI. While these proposed solutions exhibit relatively low coverage rates, they reflect innovative thinking and offer valuable insights for the promotion of sustainable and eco-friendly initiatives in HEIs. These insights hold the potential to inform policy decisions and shape processes that guarantee the enduring viability and impact of GCI.

Figure 3 presents participant perspectives on strategies to address GCI challenges, emphasising the necessity of transitioning to renewable energy sources, improving the business environment, and conducting collaborative research with academic departments. Fundraising and edutainment are also highlighted as integral components to maintain engagement in the GCI movement. These strategies, with an 80% coverage rate, underscore the need for engaging activities, sponsorships, expanded litter bin availability, strong GCI leadership for fundraising, innovative approaches to campus sustainability, and active student involvement.

While the participants' emphasis on innovation is commendable, it is imperative to ensure the sustainability of the proposed solutions over the long term. Achieving this goal requires addressing finance-related challenges, including securing adequate funding, and addressing infrastructure needs like the provision of trash bins. These insights represent invaluable contributions to the promotion of sustainable and eco-friendly initiatives in HEIs, guiding policy, and decision-making processes, and ensuring the enduring success and impact of GCI projects.

In alignment with the study's aim, it is evident that green entrepreneurship plays a pivotal role in addressing the financial challenges associated with GCI in HEIs. By fostering innovative approaches to funding and sustainability, green entrepreneurship can complement and enhance the strategies discussed in this research, ultimately contributing to the successful implementation of GCI. However, it is crucial to acknowledge the limitations of this study, including its small sample size and focus on specific stakeholder groups. Further research is warranted to generalise these findings across a broader spectrum of institutions and stakeholders. Nonetheless, this study provides valuable insights into finance-generating strategies and finance-related challenges in GCI projects, offering recommendations that can guide universities and green entrepreneurs in developing financially sustainable GCI projects that promote environmentally friendly practices and a sustainable future.

Recommendations

Based on the results obtained from the participants in this study, the following research recommendations can be made:

To develop finance-generating strategies for promoting adequate budgets

To address the financial challenges of GCI projects at DUT, a multifaceted approach is recommended. Firstly, further research should be conducted to identify successful finance-generating strategies used by green entrepreneurs in addressing the financial challenges of GCI projects. This research should focus on case studies of successful GCI projects in other HEIs. Collaboration between green entrepreneurs and universities should also be encouraged to identify innovative finance-generating strategies, such as partnerships with private sector companies, crowdfunding campaigns, or public-private partnerships. Additionally, research should be conducted to identify the most effective communication strategies for promoting finance-generating strategies to stakeholders, including campus administrators, students, and the public.

Secondly, starting a waste business industry could be a possible solution to address the financial challenges facing the implementation of GCI projects at DUT. This industry could provide a revenue stream for the institution while promoting sustainable waste management practices. The industry could focus on recycling and upcycling waste materials from the institution into new products or selling them to recycling companies. Additionally, the industry could provide employment opportunities for students and staff, further contributing to the institution's sustainability goals. However, it is important to ensure that the waste industry is environmentally sustainable and does not undermine the GCI's goals. Proper waste management practices should be followed to prevent pollution and ensure that the waste industry operates within a circular economy framework. Overall, venturing into the waste business

industry could be a viable solution to address the financial challenges facing the GCI at DUT, as long as sustainability is a top priority.

To identify finance-related challenges in Green Campus Initiatives projects across higher institutions of learning in South Africa

Further research should be conducted to identify the most common financial challenges faced by GCI projects in HEIs. This research should be conducted across a range of institutions, including community colleges, liberal arts colleges, and research universities. Research should be conducted to identify the most effective ways to address financial challenges in GCI projects, including strategies for reducing costs, increasing revenue, and improving financial management practices. Collaboration between green entrepreneurs and universities should be encouraged to develop new financial models and management practices that can help address financial challenges in GCI projects.

Overall, the results of the study suggest that there is a need for further research and collaboration between green entrepreneurs and HEIs to address the financial challenges of GCI projects. By identifying finance-generating strategies and addressing financial-related challenges, universities can promote the growth of sustainable practices and contribute to a more environmentally friendly future.

Incorporating project management to address the financial issues facing green campus initiatives

Our research suggests that applying project management principles can be an effective solution to address these challenges. By providing a framework for effective planning, execution, and control, project management can help GCI achieve their sustainability goals while also improving their financial outcomes. We recommend that universities and colleges consider adopting project management principles as a key strategy for addressing financial issues in their GCI.

Limitation and future studies

The study's sample size may limit the generalisability of the findings to other HEIs and GCI. The study used qualitative methods such as questionnaires and interviews, which may have limitations in providing a comprehensive view of finance-generating strategies and finance-related challenges in GCI projects. The study's participants were self-selected, which may have introduced biases into the study. Future research can compare the finance-generating strategies and finance-related challenges in GCI projects between HEIs in different regions or countries. Future research can be conducted over a longer period to monitor the progress and impact of finance-generating strategies and finance-related challenges in GCI projects.

Conclusion

In conclusion, the GCI stands as a robust sustainable development strategy designed to combat environmental degradation, global warming, and their adverse repercussions on economic growth. Nonetheless, the formidable obstacle of financial constraints hampers its efficacy, prominently underscored by the stark absence of financial support from institutional management. Our research reveals that 20.56% of respondents encountered hurdles in GCI implementation, predominantly linked to financial impediments and a lack of commitment within the university community. Moreover, an aura of uncertainty surrounds the regulatory framework governing conservation policies within educational institutions, albeit with indications of indirect support through existing institutional structures.

In response to these challenges, this study offers pragmatic remedies. We advocate for synergistic collaborations with academic departments, the pursuit of external funding via fundraising and sponsorships, and the strategic use of edutainment to sustain public interest in GCI endeavours. Additionally, we propose venturing into innovative financing models like green bonds while addressing essential infrastructure needs, such as the provision of more trash bins. The pivotal role of student engagement and our unwavering commitment to sustainability permeate through these recommendations, aligning cohesively with our mission to invigorate GCI's effectiveness.

Nevertheless, it is essential to acknowledge the study's inherent limitations, chiefly, the sample size's potential constraints on generalisability to diverse HEIs and varied GCI. Future research endeavours should aim to transcend these confines by conducting cross-regional and cross-country comparisons of finance-generating strategies and finance-related challenges in GCI projects. Additionally, longer-term studies should be undertaken to monitor and assess the evolving progress and far-reaching impact of GCI implementations.

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Competing interests

The authors have declared that no competing interest exists.

Authors' contributions

This research project was a collaborative effort of three authors who contributed to various aspects of the study. H.S.S. played a vital role in the early stages of the project, providing expertise in conceptualisation, investigation, visualisation, project administration, and validation. His guidance and leadership were essential in ensuring that the study was properly designed and executed. E.L. contributed significantly to the development of the methodology and was responsible for drafting the original manuscript. He also played an integral role in the revision and editing process, ensuring that the final product was of high quality and met the research objectives. B.I.D. provided essential resources and support throughout the project, including funding acquisition, supervision, and oversight. His contributions were instrumental in ensuring the success of the study and the achievement of its objectives. Together, the contributions of all the authors made this project possible and resulted in a comprehensive and high-quality research study.

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Data availability

The study findings and related figures and tables are presented in the published article. However, because of privacy and confidentiality concerns, the raw data and transcripts of the interviews cannot be shared. Any additional data requests can be directed to the corresponding author, H.S., for consideration.

Disclaimer

The opinions expressed in this research article are solely those of the authors and do not necessarily reflect the views of the institutions or organisations they are affiliated with, and the publisher. The information and data presented in this study are based on virtual semi-structured interviews with Residence Life officers and GCI practitioners, as well as a qualitative questionnaire administered to 50 GCI student supporters using Microsoft Link forms. The authors acknowledge that the sample size used in this study may not be representative of the entire population of GCI supporters and that the findings of this study may not be generalisable to all universities or higher institutions of learning. The authors have made every effort to ensure the accuracy of the information presented in this article, but they are not responsible for any errors or omissions. Readers are encouraged to verify the information presented in this article before using it for decision-making purposes.

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