BENEFITS AND CHALLENGES OF IMPLEMENTING GREEN INITIATIVES AT PUBLIC UNIVERSITIES IN SOUTH AFRICA

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Abstract.

This paper explores the benefits and challenges of implementing green initiatives at South African Universities. The study's objectives are to identify the benefits and to find ways to overcome the challenges preventing green initiative implementation. In a mixed-method approach, eight senior personnel at prominent South African universities were interviewed to identify specific green initiatives and suitable measuring criteria. A five-point Likert scale questionnaire was distributed online to other university managers and senior staff. A total of 144 personnel members completed the questionnaire. The results show that the data are reliable (α=0.843), adequate (KMO=0.641), and significant (p≤0.05 at the 95% confidence level. The respondents perceive the barriers to implementing green initiatives at public universities to be significant (≥4.5) and indicate that universities are progressing excellently with implementing some green initiatives (for example, by eliminating paper usage, electronic signing of documents, LED lighting, and paperless IT system applications) (≥4.5). The benefits of green implementation are also significant (≥4.5). Exploratory factor analysis identified three factors each for barriers, implementation, and benefits, explaining a cumulative variance of 56.1%, 82.2% and 54.8%, respectively. Public universities' management can operationalise the results in their green initiatives implementation strategies.

Keywords: *South Africa, universities, public, green initiatives, environment, strategy*

JEL Codes: *Q56, R11, I23*

1. Introduction

Many universities attempt to implement green initiatives, particularly in their operations, to reduce their operational environmental impacts. Universities are integrating environmental awareness and green initiatives using various dimensions in their activities (Marpa, 2020; Karimi *et al.,* 2021; Vasileva *et al.,* 2021) and by using different approaches to do so (Caniëls *et al.,* 2021; Anthony Jnr, 2021). Despite the broad focus on going green at universities, two approaches seem more dominant in the recent literature: 1) campus operations and 2) institutional initiatives (Amaral *et al.,* 2020; Menon & Suresh, 2020).

In this context, "campus greening "often refers to technical issues such as environmental awareness, green buildings, renewable energies, or carbon footprint and reporting. A green campus, characterised by improved energy and resource efficiency, is beneficial from the environmental point of view and can also deliver visible cost savings for the university. There are investment costs, but these are usually amortised over time when the facilities' cost-saving elements start to be calculated. In addition, such activities are important in enhancing student, personnel and community experience and motivation. Universities are often considered role models (Gholami *et al.,* 2020; Mawonde & Togo, 2019), where more green initiatives, for instance, operation and procurement, can be tried out. At the same time, universities are privileged places for transforming consumption patterns and behaviour (Mohamed *et al.,* 2020). However, green campus management seems to be narrowed to ecological issues, while the social dimension of green initiative implementation is often neglected. Although this is not trivial, a broader approach would be desirable (Leal Filho *et al.,* 2019).

2. Problem statement

The existing environmental awareness gap provides a strong signal to governments in South Africa and other African countries. If this growing environmental awareness gap is unaddressed, the next generation could burden the already stressed environment and deplete natural resources (Zhang *et al.,* 2022). Poor green economic transformation will result in the depletion of the already exhausted natural resources and an uncertain future for the country. Therefore, education is needed to establish a sustainable lifestyle for the youth to participate successfully in the green economy because of their environmental awareness levels.

The government is challenged to comply with environmental awareness needs, particularly in higher education (Arshad *et al.,* 2020). These include a limited capacity at public institutions, poor quality of environmental awareness training, and increasing capacity to match the population growth (Xu *et al.,* 2019). This green educational gap is evident and experienced in communities lacking resources and poor quality of life (Davids, 2021). The South African government should aim to raise environmental awareness by 2030 to a projected increased growth rate in all educational institutions. Yet, over the past 30 years, only two new universities have been built, one in Mimberly and the other in Mpumalanga. This signifies the core of the problem faced by South African public universities – a lack of funding. The Department of Higher Education and Training (DHET) cannot cope with the increased educational demand to keep up with the population growth. As a result, there are no state financial incentives for universities to implement green initiatives.

The political and regulatory environment and market forces directly impact environmental initiatives (Dicker et al., 2019). Universities operate in a market-oriented business environment that faces typical business micro and macro-economic factors. Universities are state-funded to provide quality education, and any green initiative should be aligned with the primary education directive from the DHET. However, as businesses, universities are not entitled to government subsidies, tax rebates, or facilities. These financial realities signify that universities need to understand better the green environment, its

barriers and benefits to their business models because implementing green initiatives on campus must align with the university's strategic goals. Hence the primary objective of this study is to outline the benefits and barriers of implementing green initiatives at universities in South Africa.

3. Research questions

This study addresses the following research questions:

RQ1: What are the benefits of implementing green initiatives at a public university?

RQ2: What barriers exist to implementing green initiatives at a public university?

4. Objectives

The aim of this research is threefold, namely to:

- identify benefits and barriers of implementing green initiatives at universities in South Africa as determined by senior personnel;
- measure university management's perceptions of the benefits and barriers of implementing green initiatives; and
- identify latent variables (or factors) of benefits and barriers when implementing green initiatives at public universities.

5. Green initiatives at public universities

Organisations, including public universities, worldwide are under pressure from stakeholders and customers to minimise their negative environmental impact and improve social performance by implementing green initiatives. Modern competitiveness includes being green and having a sustainable business strategy. Implementing green initiatives integrates two practices for achieving operational, environmental and social performance (Abualfaraa *et al.,* 2020). It aims to reduce and eliminate waste in every area to achieve profitability, convenience, efficiency and flexibility (Dwivedi *et al.,* 2021). It is also a business improvement approach that intends to transform inputs into outputs using fewer natural resources, with lower negative environmental impacts and high efficiency (Reklitis *et al.,* 2021). This practice focuses on reducing and eliminating different wastages along the value chain. It will likely minimise negative environmental impacts and achieve resource efficiency (Green *et al.,* 2019). This practice also assists universities in addressing their ecological and social sustainability and consequently gains a competitive advantage (Singh *et al.,* 2019). According to Gustafsson *et al.* (2019), implementing green initiatives helps to develop a well-organised and efficient system devoted to continuous improvement. In addition to the short-term benefits, implementing green initiatives offers the potential to achieve long-term sustainable development (Thacker *et al.,* 2019). Abualfaraa *et al.* (2020) mention that such a green strategy addresses the three pillars of sustainability, namely 1) economic, environmental, and 3) social.

In this study, sustainable economic performance refers to the operational and financial results. Environmental sustainability refers to efficiently using different resources and minimising negative environmental impacts (Green *et al.,* 2019). According to Xie *et al.* (2019), universities promoting environmental awareness can improve economic performance more effectively. Employees who perceive their universities care about the environment are more motivated, satisfied, and productive (Duarte &

Cruz-Machado, 2019). These factors facilitate 'employees' involvement in the universities' efforts to improve operational and environmental performance (Chavez *et al.,* 2020). This shows that implementing green initiatives can be a catalyst mechanism that improves operational and environmental performance. In other words, universities should not only focus on implementing green initiatives but also consider human capital as environmental awareness enhancer to achieve going green. According to Grum and Kobal Grum (2020), social sustainability ensures that the systems, structures, relationships and formal and informal processes actively support the capacity of current and future generations' capacity to create healthy communities. It aims at focusing on prioritising people's needs in development processes. It also promotes the inclusion of the poor and vulnerable through building cohesive and resilient societies, empowerment, and enabling institutions' accountability and accessibility to citizens.

5.1 Barriers to implementing green initiatives

An overview of the current literature on the barriers and the implementation of green initiatives at university campuses reveals two recurring themes, financial and organisational (Li *et al*., 2020). The literature has mixed views regarding whether going green has higher initial capital costs than traditional processes. For example, a perception that the initial capital cost of implementing green initiatives is higher. In contrast, others maintain that going green does not necessarily result in higher initial capital costs (Álvarez Jaramillo *et al*., 2019). Going green has equal capital costs and lower operating costs than conventional practices under the right circumstances (Wills, 2020). Typical barriers are:

- **Organisational** barriers and motivations, leadership, measurable sustainability targets and collaboration between designers and academics are identified as important factors for successfully implementing green initiatives on campus (Roscoe *et al.,* 2019). Firstly, the need for strong leadership and management, such as a project champion and the support of senior administration, is a critical component of successful green projects (Ali *et al.,* 2021). Secondly, sustainability targets are important prerequisites to implementing green initiatives. This includes quantifying indicators to set specific targets, from building procurement policies to the percentage of recycled material in toilet paper (Mishra, 2022). Thirdly, a collaboration between researchers and facilities management employees is important for implementing green initiatives. Collaboration has benefits for all parties involved, facilities managers lower campus operating costs and develop sustainable design expertise; professional design consultants lower costs, develop sustainable design expertise and minimise skepticism towards going green; and academics apply their research in practice, which benefits both the environment and helps secure future grant applications (Anwar *et al.,* 2020).

- **Access to capital** is a significant barrier as a university may have insufficient capital through internal funds, have difficulty raising additional funds through borrowing or may not want to take on additional debt. As a result, green initiatives investments may not be implemented. Investment may be inhibited by internal capital budgeting procedures, investment appraisal rules or managers favouring other strategic projects over going green activities (Purwandani & Michaud, 2021).

- **Bounded rationality** results in constraints on time and attention, focus on satisfactory instead of optimal selection, and constraints on the cognitive ability to process

information prevent individuals from making decisions in the manner assumed in economic models. Bounded rationality also includes reliance on routines and unwillingness to consider change (Ghadge *et al.,* 2021). As a result, such individuals may neglect going green opportunities.

- **Hidden costs** are a significant threat to university finances. Examples include costs of identifying opportunities, hassle, inconvenience, disruptions to production, increased noise, reduced service quality, problems with safety, working conditions, extra maintenance or lower reliability and costs of staff replacement and training (Charef *et al.,* 2021). These costs are often difficult to quantify. Universities may decide not to invest in profitable green measures because of potential hidden costs.

- **Imperfect information** frequently increases project risk. Inadequate information on going green opportunities or the efficient performance of technologies, lack of staff awareness or difficulty in obtaining information may result in decision-makers investing less in green initiatives (Abdel-Baset *et al.,* 2019).

- **Risk and uncertainty** from investing in efficient green ventures may present a rational response to risk. These perceived risks include business-specific, regulatory, technical, and general economic risks caused by business cycles and financial risks such as fluctuation of exchange rates and energy prices (Bhandari *et al.,* 2019). South African universities are not reliant on international students (such as Australia). Hence the study demand is mitigated to a large extent. However, funding and payments remain risky as the National Student Financial Aid Scheme bursary is under pressure.

- **Split incentives** occur when the university invests in green efficiency measures but does not reap its benefits. In such instances, green investments are likely forgone. For example, because individual departments within a university do not pay for electricity, they are not accountable for the electricity they use (most university accounting systems pay the utility bill as part of the overhead costs). As such, the department has no incentive to invest in improving its energy efficiency (Agyekum *et al.,* 2022).

5.2 Benefits of green initiatives

Implementing green initiatives is based on a framework of benefits: economic, financial, productivity, risk management, public relations and marketing, and project funding (Shad *et al.,* 2019). While not conclusive, past research has generally shown that implementing green initiatives does enjoy financial benefits in the form of lower operating costs and non-financial benefits such as a better work environment. Some benefits accrue immediately, and some to the future financial and economic performance. On the other hand, any retrofitting work requires capital expenditure as well as other associated costs during the implementation process.

- **Economic and Financial Benefits** are the most commonly cited financial benefits of going green: the savings in operating costs. These will capitalise on lower operating costs in the medium and long term (Shad *et al.,* 2019). Besides, the government offers tax incentives for purchasing green products. This programme encourages investments in clean electricity generation capacity to supplement the electricity supply (Department of National Treasury, 2023).

- **Intangible benefits** are specifically relevant in the service economy. Implementing green initiatives results in productivity gains due to healthier indoor spaces. Productivity gains from green buildings could easily equal or exceed the entire energy cost of operating a building. Besides, improvements in indoor air quality may help reduce sick building syndrome and result in less medical leave for employees. Focusing on measures to improve indoor environmental quality, such as increased ventilation, natural lighting, outdoor views, and low toxicity finishes and furniture, improve the wellness of people in green buildings (Mujan *et al.,* 2019). Green buildings also reinforce an 'institution's brand image. South Africa's retail giants like Woolworths and Pick n Pay try to improve or maintain their brand images by being associated with going green (Mukonza & Swarts, 2020). Likewise, Nelson Mandela University (NMU) built the first green business school in the country (NMU, 2023).

- **Costs of retrofit** are challenges universities need to overcome. However, the benefit of the capital downpayment in the longer term needs to be considered. Universities experience these costs as the most important short-term constraint, but the benefits of retrofitting are reaped over the long run. Retrofitting favourably affects projected energy savings, water savings and productivity gains. However, some retrofit projects may take time to implement as design complexity compels, for example, that parts of the building must be vacated (Cao *et al.,* 2022).

- **Improved innovative strategies**

When organisations engage in green innovation, they focus on their organisation as well as looking more broadly to the whole system, including the natural environment, stakeholders and communities (Afeltra *et al.,* 2023)

At the Pandit Deendayal Energy University (PDEU) in India (2023), a project was initiated to install an innovative solar power tree and vertical solar design that will give 1.5 Lacs of clean energy each year, and it will reduce 1.23 Lacs of CO2 emissions from the atmosphere. This patented technology will also save a total 8 500 square feet of space in the land and provide an equal benefit of planting 185 teak trees every year (PDEU, 2023).

- **Local communities involvement**

Community engagement increases the visibility and understanding of environmental issues and empowers community members to have their say over decisions that affect their lives and neighbourhoods (Goodman *et al.,* 2020). The University of California at Santa Barbara is a politically active community that has turned its focus to quality reporting and sustainability initiatives in recent years. To support local and sustainable food sources, the university can source 40% of its food from farms within 150 miles. Community engagement centres around several non-profit partners and research organisations aimed at educating future leaders (University of California, 2023).

- **Liberty to vote for students**

By giving them the freedom to vote, universities empower students to understand environmental issues and enable them to address them. Hence they are provided with academic and professional training geared towards environmental awareness solutions by being encouraged

to pursue interdisciplinary projects related to green matters and to select new sustainable development solutions (Sierra & Suárez-Collado, 2021). Introducing the Student Green Energy Fund at the University of South Florida allows students to propose and vote on what sustainability projects they want to see (University of South Florida, 2023).

6. Research methodology

Executive Directors, Assistant Directors, Senior Managers, Senior Lecturers and Faculty Deans from eight South African public universities were interviewed to identify the benefits and barriers of green initiatives at universities. These universities were selected after scrutiny of their websites and their engagement with green initiatives. A semi-structured interview schedule was used to interview eight online respondents from the eight universities. After the interviews, the benefits and barriers were classified, and a questionnaire was developed using a five-point Likert scale. The questionnaires were distributed online to the senior managers using Google Forms. Each university's Human Resource Department (which also acted as gatekeepers) distributed the questionnaires. A total of 144 questionnaires were completed and returned.

7. Results

The senior personnel answered questions on their perception of how the university can implement green initiatives, what the benefits are, and what implementation barriers were experienced.

7.1 Suitability of the data

The suitability of the data consists of four measures: normality, reliability, sample adequacy and significance (Pallant, 2013; Field, 2013). The normality of the data is represented by the skewness and kurtosis statistics. Positive skewness indicates that most data points are to the left of the normal bell curve. The results show that the data is slightly positively skewed and, therefore, to the left of the normal bell curve. Regarding Kurtosis, the data are peaked mildly. Although the deviation from normality, all the data points deviated within acceptable limits. The skewness (.199) and Kurtosis (.395) have values below the required .50. This means that the data is suitable and within the margins of normality (Matore & Khairani, 2020). The data can, therefore, be safely used (Field, 2013).

Table 1: Reliability of the data

Total data		Barriers		Implementation		Benefits	
Cronbach's Alpha	of Items	Cronbach's Alpha	N of Items	Cronbach's Alpha	N of Items	Cronbach's Alpha	N of Items
.843	3	.547	12	.727	11	.891	9

Cronbach's alpha coefficient (α) measured the reliability or internal consistency of the data. Table 1 reflects the reliability coefficients for Barriers, Implementation and Benefits. The data measuring

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implementing green initiatives are highly reliable (α=.837). However, the reliability of Barriers (α=.605) and Benefits (α=.641) are slightly below the desired level of reliability (α≥.70) (Field, 2013). However, the alpha coefficients are well above the minimum level of reliability of .57 (Cortina, 1993; Field, 2013). The combined alpha coefficient of all 73 criteria α=.843) shows excellent reliability and internal consistency.

The Kaiser, Meyer and Olkin (KMO) test of sample adequacy determined if sufficient data points have been collected to warrant scientific data analysis. An ideal KMO value is .70 and higher (Field, 2013), but a KMO value of .50 signifies a usable dataset (IBM SPSS, 2022). The KMO values appear in Table 2.

Table 2: KMO and Bartlett's tests

Description		Barriers	Implement	Benefits
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.605	.837	.641
Bartlett's Test of Sphericity	Approx. Chi-Square	555.107	999.611	195.611
	df	66	36	55
	Sig.	.000	.000	.000

The KMO values are Barriers (.605), Implementation (.837), and Benefits (.641). All three values comfortably exceed the lower limit of .50, while Benefits has an excellent KMO value well above .70.

In addition to the KMO value, the significance of the data was determined by Bartlett's Test of Sphericity. A p-value of less than 0.05 is required to claim significance at the 95% confidence level (p≤0.05). The results show that Bartlett's Test of Sphericity is significant (p=.00). As a result, the data is significant and suitable for use in multivariate statistical analysis (Karosekali & Santoso, 2019).

7.2 Descriptive statistics

Tables 3 to 5 show that most respondents strongly agree with the statements regarding green initiative benefits, implementation and barriers. The descriptive indicator is the mean value (representing a mean score on the five-point Likert scale). The secondary indicator is the standard deviation which indicates the consistency of the 'participants' responses on specific criteria measuring their perceptions of the benefits barriers and implementation of green initiatives at public universities.

Table 3: Benefits of implementing green initiatives

q34 Will reduce the high electricity charges	4.97	.181	149
q35 Will reduce the high-water bill	4.97	.181	149
q36 Will reduce the high printing and storage costs	4.99	.115	149
q37 Will enable readily available services for students	5.00	.000	149
q38 Easy application process for students	4.96	.197	149

q39 Will enable convenient and easy access to old documents	4.94	.226	149
q40 Will offer improved student interaction and communication	4.97	.181	149
q41 Will enable easy management of high work volumes	4.97	.181	149
q42 Will reduce the high electricity charges	4.96	.197	149
Mean: Benefits	**4.97**		

The data in Table 3 above illustrates that the universities' senior personnel strongly agree with the statements that implementing green initiatives will reduce the high operating costs like electricity, water, printing and storage charges. They also strongly agree that implementing green initiatives will offer convenience in the student application process, easy access to documents, improved student interaction and communication, and easy management of high work volumes.

Table 4: Implementing green initiatives at public universities

q11 Reduce or eliminate paper usage and aim for a paperless office	4.95	.212	149
q12 Eliminate printing and scanning by using electronic signatures	4.94	.226	149
q13 Use CFL or LED light bulbs and opt for natural light when possible	4.96	.197	149
q14 Use ceiling fans and natural ventilation instead of air conditioning	4.95	.212	149
q15 Purchase or grow office plants to offset VOCs and CO2 emissions	4.94	.226	149
q16 Donate books and manuals to local workforce development groups and charity organisations	4.96	.197	149
q17 Utilise file-sharing websites like DropBox or Google Docs rather than printing	4.95	.212	149
q18 Switch to recycled office supplies whenever possible like high post-consumer recycled content (PCR) paper	4.94	.226	149
q19 Instead of traveling for meetings, whenever possible try to use video or web conferencing services instead	4.95	.212	149

q20 Opt for online media rather than paper version, including magazines, newspapers, trade journals, and other publications	4.95	.212	149
q21 Introduce a compulsory environment sustainability module for all under graduates	4.95	.212	149
Mean: Implementation	**4.95**		

The data in Table 4 above illustrates that the universities' senior personnel strongly agree with the statements on how universities can implement green initiatives. They can start by reducing or eliminating paper usage, aiming for a paperless office, and using electronic signatures. Using CFL or LED light bulbs and opting for natural light when possible, using ceiling fans and natural ventilation instead of air conditioning, will steer the universities towards going green.

Table 5: Barriers to implementing green initiatives at public universities

	Mean	Std. Deviation	N
q22 The cost of green products too high for the University	4.94	.239	149
q23 There is a lack of training and awareness of green principles	4.97	.162	149
q24 Top management is not committed to implementing green practices	4.95	.212	149
q25 There is negative attitude from Management towards implementing green practices	3.95	.212	149
q26 There is a fear of digitalisation	4.95	.212	149
q27 Staff members are too reliant on paper	4.96	.197	149
q28 The university has resources to launch a digitalisation project	3.32	.520	149
q29 Authority; responsibility and control over certain crucial tasks will be lost	4.95	.212	149
q30 Digitalisation poses a high-risk breach on data stored online	4.97	.181	149
q31 Digitalisation poses a threat to legal admissibility of documents	4.97	.181	149
q32 It is difficult for older personnel to digitalise due to old paper habits	4.97	.162	149
q33 Lack of a green projects team combats the implementation of green initiatives	4.98	.141	149

Mean Barriers	4.74		

The data in Table 5 above illustrate that the universities' senior personnel strongly agree with the statements on the barriers to implementing green initiatives at public universities. Some of the barriers they strongly agree on is that the cost of green products is too high for the university, and there is a fear of digitalisation as staff members are too reliant on paper. There is a negative attitude from the university management towards implementing green practices as it is difficult for older personnel to digitalise due to old paper habits. Insufficient training and awareness of going green, and the lack of a green projects team exacerbates this barrier.

7.3 Exploratory factor analysis

Exploratory factor analysis identified three factors in barriers, implementation, and benefits, explaining a cumulative variance of 54.8%, 56.1% and 82.2%, respectively. A Varimax rotation was used in all three cases because it attempts to maximise the variance explained which is preferable in exploratory studies (Field, 2013). Tables 6-8 contain the rotated factor matrices for the barriers, implementation, and benefits. Only factors adhering to the Kaiser criterion (having eigenvalues equal to or more than one) were retained (Matore & Khairani, 2020; Pallant 2013). A minimum factor loading of .30 was applied. If a criterion had a factor loading below the required .30, it would be discarded from the analysis. However, no criterion was discarded because all criteria had factor loading above the threshold.

Table 6: Rotated Factors Matrix of Barriers

	Component		
	1	2	3
q31 Digitalisation poses a threat to legal admissibility of documents	.803		
q32 It is difficult for older personnel to digitalise due to old paper habits	.770		
q33 Lack of a green projects team combats the implementation of green initiatives	.760		
q27 Staff members are too reliant on paper	.741		
q22 The cost of green products too high for the university		.827	
q25 There is positive attitude from management towards implementing green practices		-.826	
q23 There is a lack of training and awareness of green principles		.515	.404
q29 Authority, responsibility and control over certain crucial tasks will be lost			-.621
q30 Digitalisation poses a high-risk breach on data stored online			.576
q26 There is a fear of digitalisation			-.544

q24 Top management is not committed to implementing green practices			.491
q28 The university does not have resources to launch a digitalisation project			.352

Extraction Method: Principal Component Analysis; Rotation Method: Varimax with Kaiser Normalization; Rotation converged in 5 iterations.

Table 7 shows that all 12 statements loaded onto three factors. These factors are labelled and discussed next.

7.3.1 Factor 1: Lack of awareness and training

The first factor deals with the personnel's perception of implementing green initiatives. Four statements, namely 31, 32, 33 and 27, loaded on Factor 1. All the statements relate to how the involvement of the university personnel can improve the green initiatives implementation process. As such, the factor is labelled *Effective use of financial resources*. Statement 31 has a factor loading above .80 which suggests that respondents perceive that digitalisation poses a significant threat to legal admissibility of documents. The factor explains a variance of 25.46%.

7.3.2 Factor 2: Managerial attitude

Factor 2 deals with management's attitude towards implementing green initiatives. Three statements, namely 22, 25 and 23, loaded on Factor 2. These statements relate to the impact of aspects such as cost and training on the green initiatives' implementation process. Specifically, the cost aspect is perceived to be cumbersome (having a factor loading higher than .80). The factor is labelled as *Managerial attitude*. The factor explains a variance of 15.73%.

7.3.3 Factor 3: Reluctance to adapt

Factor 3 deals with reluctance to change due to fear that authority, responsibility, and control over certain crucial tasks will be lost. A total of six statements, namely 23, 29, 30, 26, 24 and 28 loaded on Factor 3. All the statements under Factor 3 relate to the aspects impacting the implementation of green initiatives. Factor 3 is labelled as *Reluctance to adapt*. Statement 30 is above 0.50, suggesting that respondents perceive that digitalisation poses a high-risk breach of data stored online. The factor explains a variance of 13.20%.

Table 7: Rotated Factor matrix of Implementation

	Component		
	1	**2**	**3**
q14 Use ceiling fans and natural ventilation instead of air conditioning	.876		
q16 Donate books and manuals to local workforce development groups and charity organisations	.823		

q19 Instead of traveling for meetings, whenever possible try to use video or web conferencing services instead	.707		
q11 Reduce or eliminate paper usage and aim for a paperless office	.688		
q12 Eliminate printing and scanning by using electronic signatures		.888	
q17 Utilise file-sharing websites like DropBox or Google Docs rather than printing		.852	
q21 Introduce a compulsory environment sustainability module for all under graduates		.684	
q18 Switch to recycled office supplies whenever possible like high post-consumer recycled content (PCR) paper			.751
q13 Use CFL or LED light bulbs and opt for natural light when possible			.587
q20 Opt for online media rather than paper version, including magazines, newspapers, trade journals, and other publications			.423
q15 Purchase or grow office plants to offset VOCs and CO2 emissions			.333
Extraction Method: Principal Component Analysis; Rotation Method: Varimax with Kaiser Normalization; Rotation converged in 4 iterations.			

Table 7 above shows that all eleven statements loaded onto three factors. These factors are labelled and discussed next.

7.3.4 Factor 1: Re-allocation of resources

The first factor deals with the efficient use of available resources. This factor is labelled as the Reallocation of resources. Four statements loaded on Factor 1, namely 14,16,19 and 11. These statements relate to how universities implement operational business processes and apply their *resources*. Statements 14 and 16 have high factor loadings (above .80), suggesting that respondents perceive using ceiling fans and natural ventilation instead of air conditioning as important green initiatives. Likewise, donating books and manuals to local workforce development groups and charity organisations will contribute to a greener environment. The factor explains a variance of 24.73%.

7.3.5 Factor 2: Digitalisation

Factor 2 deals with digitalisation processes, and three statements (12,17 and 21) loaded onto the factor. All three statements relate to how the university can be digitalised. Therefore, the factor is labelled as *Digitalisation*. Statements 12 and 17 have factor loadings above 0.80 which suggests that respondents perceive green initiatives such as eliminating printing and scanning, using electronic signatures, and utilising file-sharing websites (like DropBox or Google Docs) rather than printing, will all contribute significantly to a university's green initiatives. The factor explains a variance of 19.29%.

7.3.6 Factor 3: Advanced technologies and training

Factor 3 deals with using run-off water for irrigation, using proven energy-saving equipment (so that saved energy can be redirected), and using paperless processes. Four statements, namely 18, 13, 20 and 15, loaded on factor 3. All these statements relate to the role technology (and how to use the technology efficiently) can play in green initiatives at universities. The factor also shows that switching to recycled office supplies whenever possible, like high post-consumer recycled content (PCR) paper, using CFL or LED light bulbs, and opting for natural light, will contribute to energy-saving green initiatives. Thus, the factor is labelled *Advanced technologies and training* and explains a variance of 12.05%.

Table 8: Rotated Factor Matrix of Benefits

	Component		
	1	**2**	**3**
q36 Will reduce the high printing and storage costs	.902		
q35 Will reduce the high-water bill	.845		
q37 Will enable readily available services for students	.835		
q39 Will enable convenient and easy access to old documents	.813		
q38 Easy application process for students		.869	
q40 Will offer improved student interaction and communication		.803	
q41 Will enable easy management of high work volumes		.709	
q34 Will reduce the high electricity charges			.855
q42 Will reduce electricity consumption			.655
Extraction Method: Principal Component Analysis; Rotation Method: Varimax with Kaiser Normalization; Rotation converged in 6 iterations.			

The nine benefit statements loaded onto three factors which are labelled and discussed next.

7.3.7 Factor 1: Costs saving strategies

The first factor deals with reducing the high operating costs and originates from financial resources. All four statements (36, 35, 37 and 39) relate to cost-saving green initiatives. High factor loadings above 0.80 on all four statements suggest that the benefits of implementing green practices will reduce the high printing and storage costs, high water bill, enable readily available student services, and provide convenient and improved easy access to old documents. As such, the factor is labelled as *Costs saving strategy* and explains a variance of 34.85%.

7.3.8 Factor 2: Convenience and business continuity

Factor 2 deals with improving service delivery. These statements (38, 40 and 41) all deal with active decisions in creating and maintaining more efficient services. Statements 38 and 40 have high factor loadings (above .8) which suggest that the respondents perceived green practices benefits to include an

easy student application process and will improve student interaction and communication. The factor is labelled as *Convenience and business continuity*. The factor explains a variance of 30.18%.

7.3.9 Factor 3: Reducing energy costs

Factor 3 deals with efficiently applying financial resources when greening the campus. Both statements (34 and 42) relate to the benefit of lower electricity consumption and costs when implementing green initiatives. The factor is labelled as *Reducing energy costs* and explains a variance of 17.20%.

Figure 1 summarises the factors of each implementation stage, namely overcoming barriers, implementation and benefits derived from green initiatives.
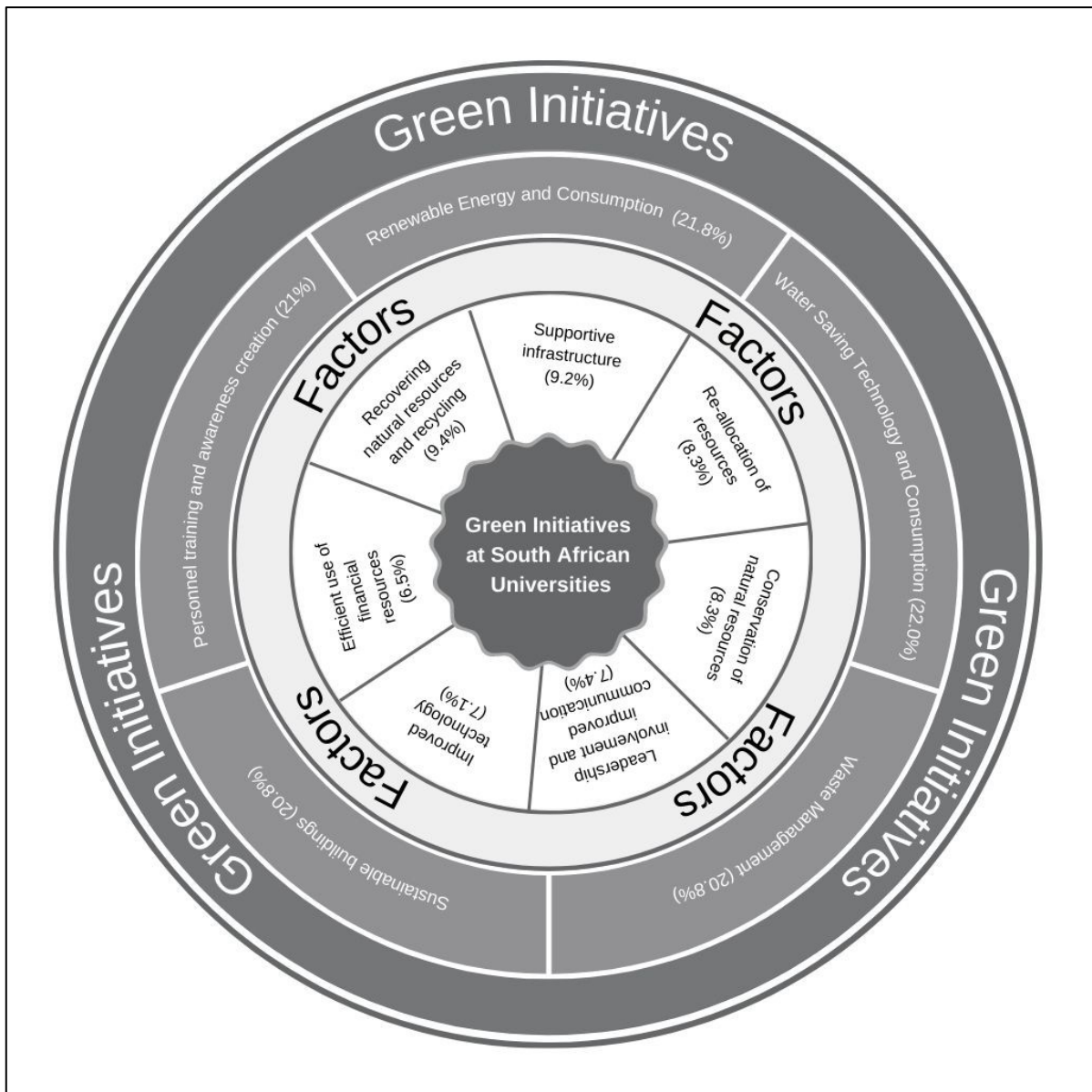
Fig. 1: Factors of barriers, implementation and benefits

8   Discussion

The article aimed to identify and empirically identify the benefits of implementing green initiatives at SAU and the barriers. The results show that organisational issues, bounded rationality, hidden costs, imperfect information, risk uncertainty and split incentives are common barriers to implementing green initiatives. There are substantial concerns about the impact on both the environmental awareness of SAU graduates and management practices due to the green initiatives' implementation barriers these

institutions face. These concerns contribute to the barriers facing universities when implementing more green initiatives.

Therefore, universities require effective communication of objectives to enable the personnel, students and other stakeholders to partake in successful green initiatives' implementation. Fragouli (2020) asserts that communication of organisational objectives facilitates internalisation of goal and policy from all personnel and students, gives the idea that the personnel and students are perceived to be crucial interactivity, maintains operation of the university and attains the university's objective. The university's efficiency depends on effective communication of the green implementation objectives as much as management (Habib *et al.,* 2021). The study thus has identified lack of awareness and training, leadership attitude and reluctance to adaptation as cause for concern.

The benefits of implementing green initiatives at SAU include economic and financial benefits, intangible benefits, cost of retrofit, improved innovative strategies, local communities involvement and liberty to vote for students. Some benefits accrue immediately, and some to the future financial and economic performance. The three factors substantiated these through Varimax rotation: costs saving strategies, convenience and business continuity and effective use of financial resources.

9   Conclusion

The findings from this study bring forth several implications for both universities directly and for government and policymakers. For universities to implement green initiatives, it may be easier to start with lower-cost strategies, such as introducing an Environmental Sustainability module, and reduce or eliminate paper usage by eliminating printing and scanning or using electronic signatures. Similarly, energy-savings from CFL or LED light bulbs and, using natural light effectively, recycling waste, using ceiling fans and natural ventilation instead of air conditioning are other options to consider. These green strategies are more easily implementable, have direct benefits, and directly contribute to any institution's financial sustainability (Broccardo & Zicari, 2020). For the universities that have already implemented some green initiatives, more progressive actions, such as adopting renewable energy, may be an alternative path forward. In addition to potentially implementing renewable energy initiatives, SAU may want to pursue formal green certification further. This certification can have several benefits, such as increased popularity from stakeholders, especially students (Leskinen et al., 2020:2-22), and improved personnel engagement. Participating entities can market themselves as environmental leaders and have access to a network of other sustainability leaders in the green business periphery. Moreover, the government can foster the implementation of green initiatives by providing additional information and raising awareness about these practices. Such an educational strategy may help diminish misconceptions that implementing green initiatives is complex, costly, and overly burdensome. The implementation of green initiatives offers a viable path forward to target and spur solutions that continue to encourage business operations with environmental systems and concerns in mind. Businesses, education institutions, governments, and other relevant stakeholders can use the results of this study to better comprehend the specificities of green business practice development and related decisions in their respective regions.

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