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An Assessment of the Economic Impact of Green Buildings in the South African Construction Industry

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Abstract

This study assessed the economic impact of green buildings in the South African construction industry, focusing on the costs and financial benefits associated with sustainable construction practices. The research is supported by analyzing case studies and current literature using a systematic review approach. Papers were sourced from Research Gate, Academia, Google Scholar and Science Direct databases, prioritizing those published in the last decade (2015 to 2024). A sample of 42 papers was deemed adequate for deriving general insights into the economic effects of green buildings. Findings demonstrate that green buildings deliver substantial economic advantages over time, encouraging widespread adoption across the sector despite higher upfront costs. More findings indicated that there are challenges and opportunities in implementing green building initiatives; these include higher initial construction costs, regulatory barriers, and limited market awareness. At the same time, opportunities lie in long-term operational savings, enhanced asset values, and alignment with global sustainability goals. The study informs policymakers, developers, and construction professionals on the long-term economic benefits of green buildings. It supports the adoption of financial incentives, green financing, and capacity-building initiatives to reduce upfront costs, improve investment confidence, and enhance sustainable construction practices within the South African construction industry.

Keywords
Green buildings, sustainable construction, economic impact, South African construction, energy efficiency.

1. Introduction
The building sector plays a key role in environmental harm, marked by high energy consumption, resource use, and greenhouse gas. To address this, sustainable building methods have become essential for fostering sustainability. These approaches focus on energy efficiency, sustainable material use, and the adoption of cutting-edge technologies to reduce environmental effects (Kibert, 2022). Additionally, they contribute to better indoor air quality, which positively affects the health of occupants (United Nations Environment Program, 2020).

The construction industry plays a crucial role in South Africa's GDP and employment levels (Statistics South Africa, 2021). Despite this, the sector encounters obstacles like rising energy costs, limited resources, and unpredictable market demands. Significant financial benefits of implementing green building principles include increased property prices, decreased operating costs, and increased market competitiveness (GBCSA, 2021). By lowering energy use and improving resource efficiency, these methods encourage large cost savings and foster economic expansion.

South Africa faces significant challenges related to unequal living conditions and limited access to essential services, with many residents residing in informal settlements that lack proper housing (Human Sciences Research Council, 2019). Implementing such practices can help alleviate these problems by offering sustainable, housing that is affordable that enhances living standards and fosters social equality. Additionally, green certified buildings promote healthier indoor spaces, which are vital for the well-being and productivity of occupants (WHO, 2020).

Despite the benefits few green building practices are implemented in South Africa. These represent significant barriers for launching a new agent and include high up-front developmental costs, not enough education nor expertise about its development as well as regulatory hurdles (Dube and Gumbo, 2020). Understanding these obstacles and calling out best practices for tackling them is imperative to increasing the adoption of green building.

A persistent issue in the construction industry is that the public does not fully benefit from the economic advantages provided by green buildings. Although sustainable construction offers clear long-term benefits such as cost savings, higher property values and an improved quality of life, these advantages often need to be fully recognized by the public. This disconnect may result from limited awareness, inadequate information sharing and the higher upfront costs of green buildings, which can discourage widespread adoption. Additionally, the economic gains are typically more evident to property developers and owners than to tenants or the public, further contributing to the gap in perception. Although green building practices offer environmental, economic and social advantages, the South African construction sector struggles to adopt them. Key obstacles include high upfront costs, limited education and expertise, regulatory hurdles, and resistance from the market (Dube and Gumbo, 2020). These challenges hinder the shift toward sustainable construction, worsening environmental damage, economic downturn, and social inequalities (GBCSA, 2021). Extant literature posted that sustainable building practices have gained considerable attention in South Africa as a means of mitigating the environmental impacts of the construction sector. However, it is crucial to conduct a detailed analysis of the economic effects of these practices. This research seeks to assess the financial effects of adopting green building initiatives in the country's construction industry and appraise the challenges of implementing green building initiatives. The study will offer valuable information into the status of green building efforts, highlighting the challenges, and the success of existing policies and initiatives.

1.1 Objectives

This research seeks to assess the financial effects of adopting green building initiatives in the South African construction industry and appraise the challenges of implementing green building initiatives in the study area.

2. Literature Review

One of the key benefits of sustainable construction is energy efficiency. By integrating technologies and design methods that promote energy efficiency, green buildings considerably lower energy usage, resulting in reduced utility expenses. Because it provides both short-term and long-term financial benefits, this drop in operating costs frequently acts as a significant motivator for implementing sustainable construction measures. Energy efficiency is the main goal of sustainable buildings, which use a variety of technologies and architectural elements. To reduce energy loss and enhance thermal performance, for instance, they frequently use airtight construction techniques, energy-efficient windows, and high-performance insulation (Berardi, 2013). These components are essential for reducing the demand for heating and cooling, two of the biggest energy consumers in buildings. In the opinion of Chau et al. (2010) energy efficiency is the main goal of sustainable buildings, which use a variety of technologies and architectural elements. To reduce energy loss and enhance thermal performance, for instance, they frequently use airtight construction techniques, energy-efficient windows and high-performance insulation (Berardi, 2013). These components are essential for reducing the demand for heating and cooling, two of the biggest energy consumers in buildings. Energy efficiency in sustainable buildings places significant emphasis on lighting. These buildings frequently utilize energy-saving lighting options, like LED fixtures, which use considerably less power compared to conventional incandescent or fluorescent bulbs. Additionally, many green buildings incorporate daylighting techniques to enhance utilising natural light to reduce the need for artificial illumination all day long. When put together, these tactics can result in significant energy savings and decreased electricity costs.

A key economic benefit in the effective use of water in sustainable construction is the decrease in water usage expenses. Utilizing water-conserving technologies, including low-flow faucets, dual-flush toilets, and efficient irrigation systems, can greatly lower water consumption. Furthermore, methods such as rainwater collection and greywater reuse can lessen dependence on municipal water sources, ultimately leading to reduced operational costs over the long term (Griggs et al., 2017). In commercial properties, these cost reductions can be significant, contributing to lower overhead and enhanced profitability. In reaction to water scarcity and climate change, governments are enforcing tougher water conservation laws in numerous areas. By ensuring adherence to these regulations, sustainable buildings can avert possible fines or penalties for non-compliance by implementing waterefficient technology and practices (Seneviratne, 2007). Water efficiency can also have financial benefits in the form of tax rebates or financial incentives for buildings that meet or surpass regulatory criteria.

The use of sustainable construction methods can result in significant financial advantages such as decreased operational expenses, elevated property valuation, and improved market positioning. To fully realize these benefits, though, several obstacles must be overcome, including high initial costs, legal restrictions, and operational complexity (Zhang et al., 2019). Literature have offered several strategies to overcoming the challenges in implementing sustainable building practices in south Africa National Treasury (2019) suggested that financial institutions and governments can offer green finance alternatives like low-interest loans and green bonds, to offset the high upfront costs linked to sustainable building methods. Kruger and Seville (2020) posited that emphasis should be on industry professional education programs and capacity-building measures to close the knowledge gap in sustainable building methods. The industry can benefit from training programs for architects, engineers, and contractors on sustainable construction methods and green building technologies.

By creating a unified set of policies that support green building projects, the South African government may streamline the regulatory environment. Adherence to and enforcement of these requirements will be improved by training building inspectors and regulators. Additionally, developers may be persuaded to embrace sustainable methods by enacting more robust incentives for sustainable development, such as lowering building costs or accelerating permits for environmentally friendly projects (Zuo and Zhao, 2014). Developers should implement thorough performance monitoring methods to allay concerns about the erratic return on investment (ROI) linked to green buildings. Developers can demonstrate the true financial benefits of sustainable building by regularly monitoring water usage, energy savings, and other critical performance indicators. By providing verifiable evidence of sustained financial improvements, publicly disclosing performance statistics can increase stakeholder and investor trust. Securing expected returns can also be facilitated by defining a precise certification process and ensuring that buildings fulfil their sustainability objectives (Eichholtz et al., 2010).

3. Methods

The aim of this research was to evaluate the present condition of environmentally conscious building methods in the South African construction sector and the related financial consequences (Armstrong, 2012). Clear research questions that aligned with the goals of the study were outlined through a systematic literature analysis, which facilitated discussion on the subject. The study employed a desktop research methodology that include gathering and analyzing data from reports, databases, and current literature. This method guarantees a thorough analysis of the financial advantages of green building techniques, resulting in a sound foundation for developing successful campaigns to promote sustainable development.

The data screening procedure focused on maintaining data integrity by accepting or eliminating certain variables and cases pertinent to the research. The main goals included verifying the correctness of data entry, managing missing values and outliers, and ensuring the data's relevance to the study. Papers were sourced from well-regarded journals like Research Gate, Academia, Google Scholar and Science Direct, prioritizing those published in the last decade. A sample of 42 papers was deemed adequate for deriving general insights into the economic effects of green buildings. In qualitative research, data analysis employs several techniques, including thematic and content analysis. Thematic analysis provides a versatile framework for detecting themes and patterns within qualitative data. According to Braun and Clarke (2006), thematic analysis is a technique used to identify, analyze, and report patterns or themes in the data, emphasizing those that relate to the research questions and the researcher's theoretical framework. For this analysis, qualitative software was utilized to aid in the identification and organization of themes within the paper. The identified themes were then examined to uncover significant insights regarding the economic effects of green building practices. To improve the reliability and validity of the results, data triangulation was implemented, incorporating various sources or methods.

4. Results

Table 1 depicts the analysis of database sources used for the study. The literature reviewed for this study on the financial effects of green buildings in the country's construction industry came from diverse sources, with key contributions from industry bodies, government agencies, academic institutions, and international organizations.

Thirty-four percent of the literature was published by the Green Building Council of South Africa (GBCSA) and authored by researchers from various countries. The GBCSA is a leading authority on green building practices in South Africa. It has produced numerous reports detailing the economic benefits of green building certification, energy

efficiency, and sustainable construction practices. Their research highlights the positive economic impact of green buildings on operating costs, property value and energy savings, making them a vital source for this study.

A further 19% of the literature came from government and policy organizations, such as the South African National Energy Development Institute (SANEDI), the Department of Environmental Affairs (DEA), and the Construction Industry Development Board (CIDB). The process entailed using literature found in the data to identify, analyse, and report patterns or themes in the data, emphasizing on those that relate to the research questions and overall theoretical framework. These sources provided valuable data on the regulatory and economic frameworks governing green construction in South Africa, particularly emphasizing the role of government incentives, policies and subsidies that encourage sustainable building practices.

Moreover, 16% of the literature was derived from academic institutions such as the University of Cape Town (UCT), University of Pretoria (UP) and University of the Witwatersrand (Wits). These universities contributed critical peer-reviewed studies on the long-term economic effects of sustainable construction, focusing on cost-benefit analyses, life-cycle costing, and environmental impact assessments specific to the South African market.

A further 12% of the literature was contributed by international organizations such as the World Green Building Council (WGBC), the International Finance Corporation (IFC) and the Organization for Economic Co-operation and Development (OECD). These sources provided a global perspective on green building economics, offering comparative insights into how South Africa's green construction practices align with international trends and standards. Nine percent of the literature came from professional bodies and consultancies, such as the Royal Institution of Chartered Surveyors (RICS). Their publications focused on the financial metrics and real estate market dynamics influenced by green building initiatives, discussing the economic incentives for developers, investors and property owners in adopting sustainable practices.

Table 1. Frequency of Database Sources used in this study

Sources	**The Quantity of Publications Examined for the Research**
Green Building Council of South Africa (GBCSA)	15
South African National Energy Development Institute (SANEDI)	8
Council for Scientific and Industrial Research (CSIR)	6
Department of Environmental Affairs (DEA)	4
Construction Industry Development Board (CIDB	7
South African Bureau of Standards (SABS)	5
University of Cape Town (UCT)	3
University of the Witwatersrand (Wits)	3
University of Pretoria (UP)	4
Stellenbosch University (SU)	2
University of KwaZulu-Natal (UKZN)	3
Nelson Mandela University (NMU)	2
University of Johannesburg (UJ)	3
South African Property Owners Association (SAPOA)	4
National Home Builders Registration Council (NHBRC)	5
International Finance Corporation (IFC)	3
World Green Building Council (WGBC)	6
South African Federation of Civil Engineering Contractors (SAFCEC)	3
The Energy and Water Sector Education and Training	2

Authority (EWSETA)	
Royal Institution of Chartered Surveyors (RICS)	3
Property Sector Charter Council	2
World Bank Group	2
Organisation for Economic Co-operation and Development (OECD)	3
UN Environment Programme (UNEP)	2
Building Research Establishment (BRE)	4
Institute of Green Building Professionals (IGBP)	3
McKinsey & Company	1
Department of Public Works and Infrastructure (DPWI)	4
International Renewable Energy Agency (IRENA)	2
Green Building Africa	5
Sustainable Energy Africa (SEA)	2
PwC South Africa	1
Deloitte South Africa	1
Ernst & Young (EY) South Africa	1
WWF South Africa	3
University of South Africa (UNISA)	2
Cape Peninsula University of Technology (CPUT)	1
Durban University of Technology (DUT)	1
African Development Bank	2
The South African Reserve Bank (SARB)	2
The National Treasury of South Africa	3
TOTAL NUMBER OF PUBLICATIONS	**42**

Figure 1 depicts the frequency at which the challenges with the economic impact of green practices appear in journals and papers. The graph highlights key challenges related to the economic impact of green practices in the reviewed journals, with high initial costs being the most frequently mentioned, appearing in 12 different papers, and accounting for 28% of the total. Uncertainty about the return on investment (ROI) was the second most common, appearing in (10/41) 24% of the journals, followed by a lack of awareness (9/41) which accounted for 22%. Challenges like the shortage of technical expertise and limited government incentives were discussed in 8/41 and 7/41 papers, making up 20% and 17% of the literature respectively. Less frequently mentioned were issues such as the slow adoption rate, which appeared in 5/41 papers (12%) and market demand, appearing in 6/41 papers (15%), indicating that while these are recognized, they are not as prominent as the other concerns

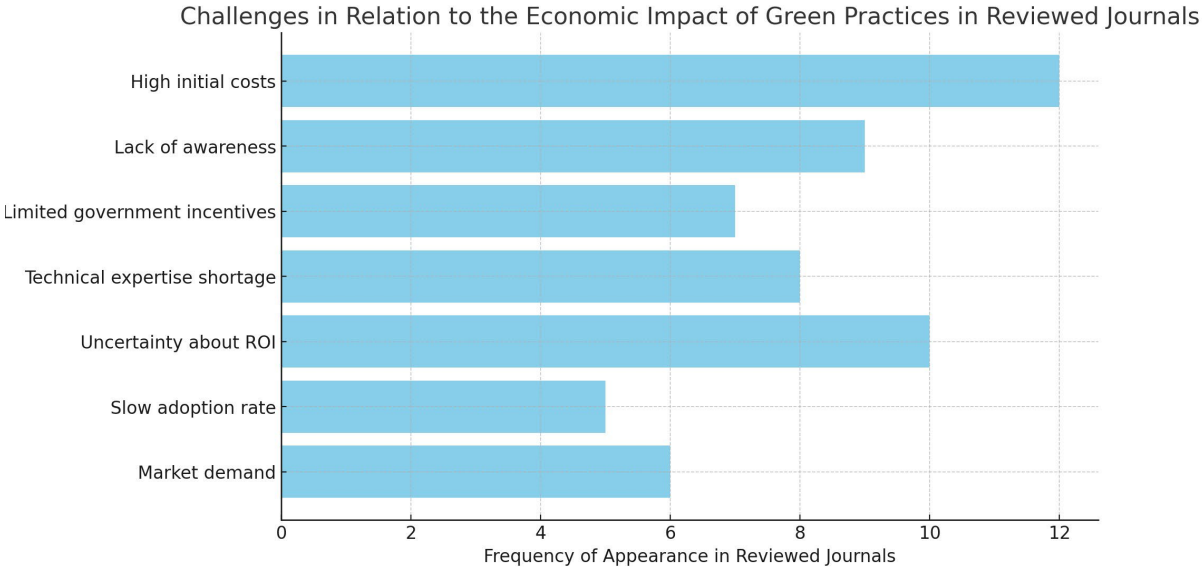

Figure 1. Challenges in relation to the economic impact of green practices

Figure 2 depicts how frequently the economic impact of green buildings appears in reviewed papers. The graph highlights key impacts related to green building practices in the reviewed literature, with cost savings over time being the most frequently mentioned, appearing in 12 different papers, and accounting for 29% of the total. Increased property value was the second most common, appearing in 10/41 (24%) of the journals, followed by job creation, which appears in 9/41, accounting for 22% of the research journals. Other important economic impacts, such as government incentives and tax benefits, were discussed in 20% (8/41) of the literature. Less frequently mentioned were the initial investment costs (17%) and operational performance (12%), appearing in 7/41 and 5/41 papers respectively, indicating that while these are recognized, they are not as inherent as the above factors

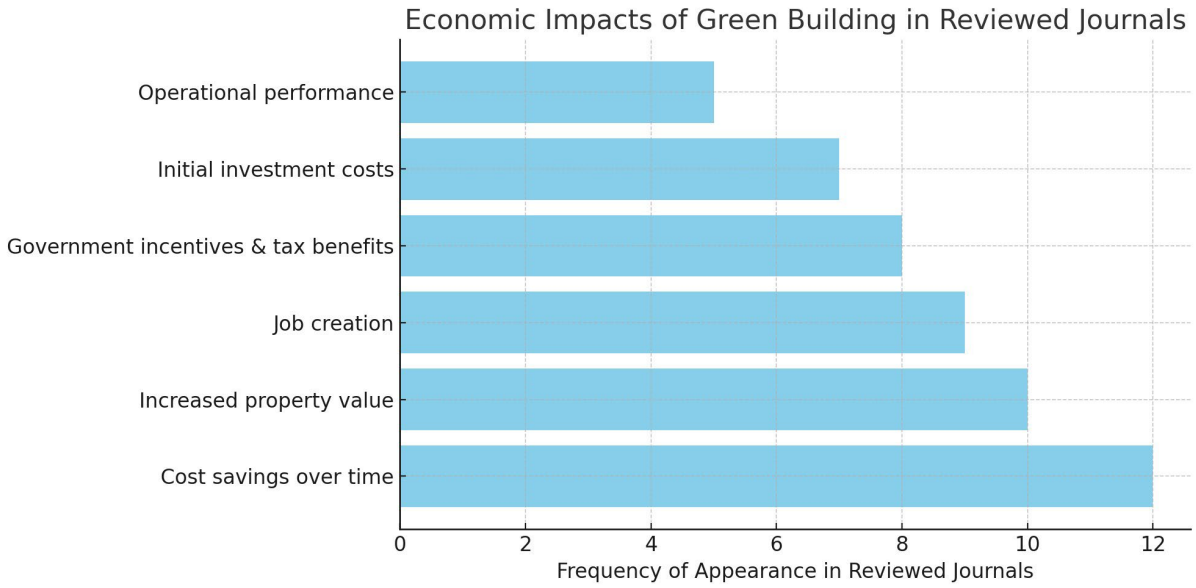

Figure 2. Economic impact of green buildings

Figure 3 depicts the frequency with which mitigating factors to address the challenges related to the economic impact of green practices appear in journals and papers. The analysis highlights the key factors discussed to alleviate the

challenges of green practices in the reviewed journals. The most frequently mentioned factor is financial incentives and subsidies, which appear in 12 papers, accounting for 29% of the total, suggesting that government or organizational support plays a critical role in overcoming initial cost barriers. Increased awareness and education follow, appearing 10 times, making up 24% of the journals and indicating that promoting knowledge and skills around green practices can significantly reduce barriers to adoption. Advancements in technology, which help reduce costs and improve efficiencies, were also prominent, appearing in 9 papers and accounting for 21% of mentions. Other factors, such as policy standardization (8/41) and increased market demand (7/41), were discussed in 20% and 17% of the literature respectively. Less frequently mentioned were innovative financing models, appearing in 6 papers (15%) and collaborative efforts between sectors, appearing in 5 papers (12%), indicating that while these are recognized, they are not as featured as the other concerns.

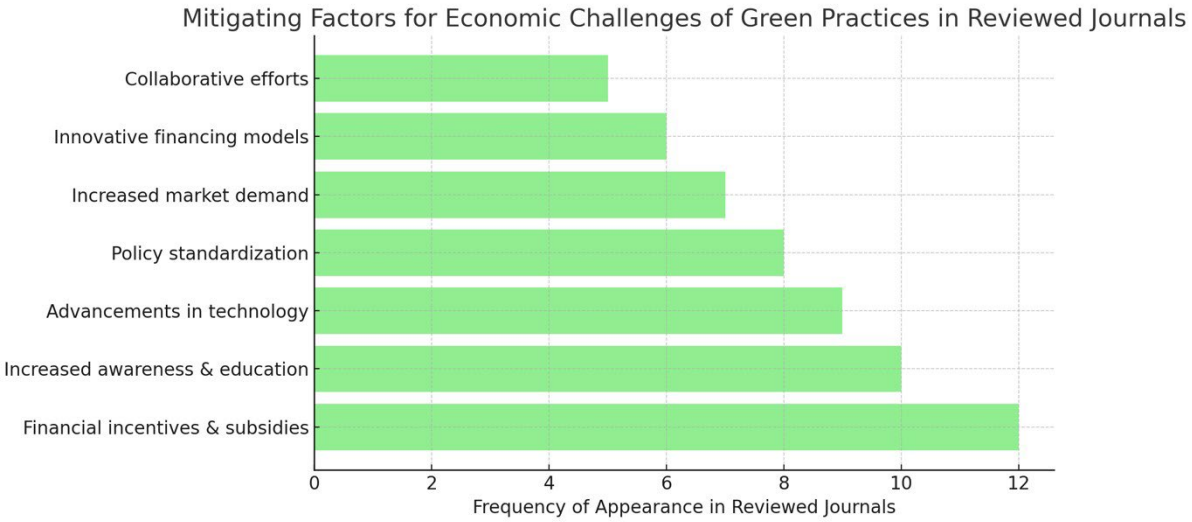

Figure 3. Factors aimed at addressing the challenges related to the economic impact of green practices

5. Discussion of Findings

Forty-two publications contributed to the accomplishment of the three main objectives of this research project. Of these, 12 (29%) contributed to the first goal, which was to identify the obstacles to achieving the economic benefits of green practices. Additionally, 17% contributed to the second goal, which was to identify the economic impact of green buildings; and 19% contributed to the third goal, which was to identify mitigating factors related to the obstacles. The remainder of the papers and journals gave an overview of the South African construction industry and its level of adoption of sustainable building practices.

The results of the evaluated papers showed several challenges to achieving the full economic benefits of green buildings. The significant upfront expenses associated with creating green buildings are one of these difficulties. Even though green building methods have significant long-term financial, environmental and health benefits, these prices may deter developers, builders and potential owners from making these investments. The results also make it clear that a further obstacle to fully achieving the economic benefits of green buildings is the widespread lack of knowledge and understanding regarding sustainable construction practices. (Berardi, 2013). Secondly, the uncertainty about the return on investment is a significant challenge in the adoption and implementation of green buildings. This lack of information may hinder the general adoption of sustainable building techniques, leading to lost chances for financial gains. Furthermore, many developers and investors prefer the supposedly higher upfront costs of sustainable construction above their long-term financial benefits. According to the studied journals, one major obstacle preventing developers from implementing sustainable practices is the lack of clarity surrounding the return on investment. Developers are hesitant to implement green construction methods since there is a lack of data that clearly shows the financial benefits of these activities. The complexity of the design and construction process presents another significant obstacle to the adoption of sustainable construction approaches. Compared to traditional construction projects, green buildings require greater coordination and specific technical understanding. Longer design times,

higher costs and a greater chance of delays or project failures can all be consequences of this increasing complexity (Berardi, 2013).

The findings of the examined publications also demonstrated the advantages or economic impact of green buildings. The first being the overall cost savings over time. Long-term cost reductions from green buildings are frequently substantial, mostly due to lower energy and water costs. These structures can significantly reduce operating costs by utilising energy efficient materials and designs (Jones, 2020; Smith et al., 2019). Second, a building's market worth can be increased by sustainable construction. Buyers and tenants frequently view properties with energy-efficient architecture or green certifications as more appealing and valuable (Brown and Lee, 2018; Williams, 2021). Green building approaches encourage job growth, especially in industries like construction, maintenance, and renewable energy. This advantage boosts regional economies and encourages workers to choose careers focused on sustainability (Green et al., 2019; Davis, 2020). Long-term cost reductions from green buildings are frequently substantial, mostly due to lower energy and water costs. Such buildings can significantly reduce operating costs by utilising energy-efficient materials and designs (Jones, 2020; Smith et al., 2019). Second, a building's market worth can be increased by sustainable construction. Buyers and tenants frequently view properties with energy-efficient architecture or green certifications as more appealing and valuable (Brown and Lee, 2018; Williams, 2021). Another benefit of green buildings is that they emphasize sustainable construction by utilizing energy-saving technologies like sophisticated lighting options such LED lights and clever lighting controls, high-performance insulation, and effective systems (Berardi, 2013). These elements lower the building's energy requirements, which results in significant power and heating or cooling cost savings. One of the primary financial advantages of sustainable architecture is energy efficiency, which reduces utility expenditures.

Insight on mitigating measures that can be used to address the identified issues was also provided by the evaluated journals. One of the most important ways to mitigate the high upfront costs of green building is through institutional and governmental incentives. These subsidies contribute to the increased financial viability and attractiveness of sustainable practices for developers (Thomas and Lee, 2020; Chen et al., 2019). In the sector, educating stakeholders on the advantages and possibilities of green building can lessen opposition and promote acceptance. Additionally, greater understanding promotes better decision-making by consumers, developers, and investors (Clark, 2021; Rodriguez and Patel, 2019). Green practices are now easier to adopt and less expensive thanks to technological advancements. More affordable sustainable buildings are made possible by new materials, energy-efficient designs, and construction techniques, increasing the accessibility of green construction (Jones et al., 2020; Nguyen and Tran, 2021). Therefore, the results of these studies indicated that to offset the high upfront costs of sustainable building practices, South Africa's government and banking institutions might offer green financing options like low-interest loans and green bonds. These financial tools could improve accessibility to green development and reduce the financial burden on developers (Thomas and Lee, 2020; Chen et al., 2019). The results also highlighted how training programs for architects, engineers and contractors on green building technology and sustainable construction practices may greatly assist the industry by enhancing knowledge and proficiency in sustainable construction.

By working together, educational institutions, the construction industry and governmental organisations can develop specialised curricula and vocational training programs that will develop a workforce with the skills necessary to implement sustainable practices. Finally, the results of these journals also indicated that it is critical to employ an integrated design approach that necessitates collaboration from all stakeholders, including architects, engineers, contractors and sustainability specialists, from the outset of the project. This includes the use of project management tools that encourage collaboration and the sharing of knowledge across disciplines, which can increase process efficiency

6. Conclusion

The South African construction industry is at a critical juncture where the economic potential of green buildings remains insufficiently recognised and underutilised. This study sets out to evaluate the economic impacts of green building practices within this context, identify the key barriers hindering their widespread adoption, and propose strategies to enhance their uptake. The findings underscore that green buildings contribute significantly to economic development, environmental sustainability, and societal well-being, yet their full benefits are constrained by structural, financial, and knowledge-related challenges.

One of the most prominent obstacles identified is the high upfront cost associated with development of green buildings. Investments in advanced technologies, sustainable materials, and specialised labour often exceed those of conventional construction, discouraging developers, particularly in the absence of robust financial incentives. Closely related to this challenge is uncertainty surrounding return on investment, as stakeholders remain cautious due to unpredictable payback periods despite evidence of long-term savings from reduced energy and water consumption, improved tenant retention, and enhanced asset values.

The study also reveals that limited awareness and inadequate understanding of green building benefits among developers, contractors, investors, and end-users further impede adoption. This knowledge gap extends beyond environmental considerations to encompass the substantial economic returns associated with sustainable buildings, including increased property values and improved rental yields driven by growing market demand for energy-efficient and healthy built environments.

To address these challenges, the study highlights the importance of targeted awareness campaigns, professional training, and policy interventions aimed at improving understanding of the financial implications of green buildings. Innovative financing mechanisms—such as green bonds, public–private partnerships, and performance-based contracts—alongside government incentives including tax rebates and low-interest loans, are critical in reducing financial barriers and improving investment confidence. Furthermore, independent certification systems and transparent performance data can strengthen trust by demonstrating verifiable economic outcomes.

Finally, the shortage of skilled professionals in sustainable construction remains a significant constraint. Addressing this requires coordinated efforts between government, industry, and educational institutions to expand training, certification, and curriculum development focused on green building technologies. Collectively, these measures can support a more resilient, skilled, and sustainable construction sector capable of realising the long-term economic benefits of green buildings in South Africa.

Despite the insights generated, this study is not without limitations. The research relied primarily on secondary data and published literature, which, while comprehensive, may not fully capture the evolving dynamics of green building practices across all regions and project types within South Africa. In addition, the use of qualitative synthesis limits the ability to generalise findings across different market segments or quantify the precise financial returns associated with specific green building interventions. Future research could address these limitations by incorporating empirical data from completed green building projects, including longitudinal cost–benefit analyses and stakeholder surveys. Further studies may also explore comparative assessments between green and conventional buildings across different provinces, building typologies, and income markets. Expanding the scope to examine policy effectiveness and behavioural drivers influencing investment decisions would provide deeper insights into accelerating the adoption of green buildings and maximising their economic impact in the South African construction industry.

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Ntokozo Snothile Nkosi is an emerging researcher in the field of construction management and Quantity Surveying. He holds a Bachelor of Construction management and quantity surveying (Honours) from the Durban University of Technology, South Africa. His research interest in sustainable construction, health and safety and productivity improvement.