

KEY BARRIERS TO THE ADOPTION OF GREEN BUILDING IN THE CONSTRUCTION INDUSTRY

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This study sought to investigate the main barriers to the adoption of green building, with a view to identifying incentives to enhance the implementation thereof in South Africa. A qualitative approach was adopted using semi-structured interviews with purposively selected knowledgeable construction industry stakeholders in the city of Bloemfontein, South Africa. Thematic analysis was used to analyze the data. The main barriers identified included high cost of green building materials, limited knowledge, low demand, lack of green technology and techniques, lengthy process, poor government support, lack of building codes and regulations, lack of awareness and of green material availability. The incentives to encourage adoption included economic incentives, affordable green building materials, government support, increased awareness and promotion of green building benefits, more financing options, awards and recognition, better accreditation bodies and increased training programs. Despite numerous benefits of green building in literature, there is limited adoption in practice especially in less developed countries. The study provides useful insights into the key constraints of green building adoption, which are useful to construction industry stakeholders in developing policies, strategies and incentives to promote to achieve sustainable practices.

Keywords: Constraints, Sustainability, Sustainable construction incentives, Implementation.

1 INTRODUCTION

Globally, the construction industry continuously encounters problems such as exceeding project duration and budget, waste generation, exerting negative effects on to the environment and high resource usage (Hussin *et al.* 2013). The industry is also deemed to be one of the largest contributors to environmental pollution (Samer 2013, Wu *et al.* 2016). Challenges such as carbon emissions cannot be combated by traditional construction practices and management, which highlight the need for construction practices and technology to improve (Hussin *et al.* 2013). The urgency to provide green buildings in South Africa is driven primarily by environmental challenges such as the energy crisis, recurring water shortages and climate change (Simpeh and Smallwood 2018).

Despite an increase in awareness, knowledge and promotion of green building, South Africa continues to lag behind in the implementation of green buildings as a result of the slow rate of change in the construction industry (Simpeh and Smallwood 2018). The aim of this study was to investigate the main barriers to the adoption of green building, with a view to identifying incentives to enhance the implementation thereof in South Africa. The study's outcomes on green building practices and barriers will be useful to the Green Building Council, professionals such as architects,

quantity surveyors, project managers, construction managers etc. and clients of the construction industry.

2 SUSTAINABILITY ISSUES IN CONSTRUCTION

The construction industry is project-based and involves several stakeholders working together to deliver a product, with the stakeholders having different expectations (Xue *et al.* 2014). The industry contributes significantly to climate change and natural resource depletion (Díaz-López *et al.* 2021). South Africa, like other developing countries consumes large amounts of resources resulting in pollution, degradation and destruction of land and the environment, as well as high energy level consumption (Ofori 2012). The environment is negatively affected by the construction industry as a result of its waste generation and large contribution to landfills, excessive usage of non-renewable resources and water and air pollution (Aigbavboa *et al.* 2017).

Green building practices aim to lessen the environmental impact of buildings through the design and build of resource efficient, healthy buildings using ecological based principles (Nduka and Ogunsanmi 2015). Various practices and techniques are used to decrease the impact of buildings on energy consumption, human health and the environment (Nduka and Ogunsanmi 2015). Green building is a process and product incorporating energy efficiency, resource-efficient materials, water conservation, waste minimisation, pollution prevention and indoor environmental quality in all life cycle phases (Zenios and Allen 2016). Ahn and Pearce (2013) and Kibert (2018) highlight the main green building practices adopted such as sustainable site planning, orientation of a building (north facing), use of green materials and suppliers, renewable and/or recycled materials, effective construction waste management, using high efficiency lighting, energy efficient appliances, rainwater harvesting systems and/or greywater recycling systems.

The delivery of green buildings is more strenuous compared to traditional construction project delivery (Saka *et al.* 2021), and this poses an obstacle to green building adoption (Aghimien *et al.* 2018). Marsh *et al.* (2020) classified the barriers to the implementation and adoption of green building into five themes, namely: i) economic barriers associated with financial aspects namely cost, time and risk involved with green building; ii) stakeholder barriers associated with the leadership, management and mentoring in the construction industry, methods of application and strategies relating to the promotion of green building; iii) social barriers associated with social norms and cultural values in the construction industry; iv) technological barriers associated with the technology, materials and technological specifications needed to adopt green building; and v) political barriers associated with government, policies, regulations, laws, initiatives, incentives and performance measurement tools to identify and incentivise the implementation of green building. Marsh *et al.* (2020) identified five main barriers as; lack of knowledge of green building, resistance to change, lack of building codes and regulations, lack of government support and incentives and limited availability of green product suppliers, materials and technologies.

Further, Aigbavboa *et al.* (2017) found the following barriers: additional building costs, limited understanding of the benefits of sustainable construction, mobilization of resources to support technological changes, misconception of construction cost overrun, lack of coordination of resources, lack of public awareness, client reluctance and initializing sustainability. Implementation of green building requires additional costs, such as green material acquisition which adheres to relevant criteria and 'green' standards (Windapo and Goulding 2015). According to Dwaikat and Ali (2016), green building cost premium range from 0 to 21% more than traditional buildings, depending on the type of building; with office buildings having the greatest cost premium of 21%. Weerasinghe and Ramachandra (2018) concluded that green industrial buildings provide an overall reduction of 21%, achievable over the building's lifetime.

3 METHODOLOGY

A mixed method approach was adopted for this study employing a quantitative survey and qualitative interviews. For this paper, only the qualitative findings are reported on. Five (5) semi-structured interviews were used in the study among construction professionals, mainly project managers, architects and quantity surveyors. Purposive sampling was used where the researcher selected the participants according to knowledge and professional judgement or experience in green building construction to be able to answer research questions as best as possible. The study also allowed snowballing sampling of respondents, as they made referrals of the next participants. The respondents were contacted by telephone and email and asked to take part in the study.

The interviews were conducted online, telephonically and face to face where necessary. The semi-structured interviews were recorded by means of note taking and audio recordings, and later transcribed. From the transcripts, the data was coded, and findings were collectively thematically analyzed. Some of the emerging themes were then ranked to aid in the explanation of the findings as shown in the data analysis section. The participants were fairly spread from the following provinces: Free State Gauteng, Kwa-Zulu Natal, Western Cape and Limpopo. The respondents had construction industry experience of more than 6 years as shown in Table 1.

Table 1. Demographic information of interviewees.

Interviewee	Profession	Rank	Years of experience	Professional registration
A	Architect	Director	40+	SACAP
B	Architect	Architect	9	SACAP
C	Project Manager	Associate Director	6	-
D	Project Manager	Managing Director	17	SACPCMP
E	Construction Project Manager	Director	25+	SACPCMP

Note:

SACAP = South African Council for the Architectural Profession

SACPCMP = South African Council for Construction Project Management Professions

4 DATA ANALYSIS / FINDINGS

4.1 Barriers to Green Building Adoption

Respondents were asked to indicate the main barriers to implementing green building practices on their projects, in their organisation or industry, and to rank the barriers from most (denoted by 1) to least affecting. The barriers to green building adoption were ranked in shown Table 2.

From Table 2, the ten main barriers to green building adoption are high cost, limited knowledge, high cost of green building materials, lack of interest/demand, lack of green technology and techniques, time consuming process, lack of government support, lack of building codes and regulations, lack of green awareness and lack of green materials availability. The findings are in correlation with the findings of Marsh *et al.* (2020) as well as with Aigbavboa *et al.* (2017). The results confirm that there are several barriers hindering the successful adoption of green building in South Africa (Marsh *et al.* 2020).

Table 2. Barriers to green building adoption.

Barriers to Green Building Adoption	Rank
High cost	1
Limited knowledge	2
High cost of green building materials	3
Lack of interest (demand)	4
Lack of green technology and techniques	5
Time consuming process	6
Lack of government support	7
Lack of building codes and regulations	8
Lack of green awareness	9
Lack of green building materials availability	10
Fear of change	11
Fear of risk of investment	12
Lack of leadership and responsibility	13
Lack of measurement tool	14
Legislation and policies	15
Lack of stakeholder involvement	16

4.2 Green Building Incentives to Encourage Adoption

From the research findings, a number of incentives emerged as indicated in Table 3.

Table 3. Green building incentives.

Green Building Incentives	Importance
Government support (government / political will)	3
Economic Incentives (economic / grants, tax rebates)	1
More Awards and Recognition (appreciation)	6
Better Accreditation Bodies (standards / codes)	7
Availability of more Financing Options (financial)	5
Availability of more Affordable Green Building Materials (Physical resources)	2
Increased Awareness and Promotion of Green Building Benefit (Awareness / Knowledge)	4

From Table 3, it was emphasized that economic incentives (grants, tax rebates etc.) is a major incentive to green building adoption. It also emerged that the availability of more affordable green building materials, increased government support, increased awareness and promotion of green building benefits are incentives which should be used to encourage behaviour of firms towards more adoption of green building in their projects. More financing options, awards and recognition and better accreditation bodies also emerged as incentives worth exploring. The findings are in correlation with the findings of Marsh *et al.* (2020), Gou (2019) and Mulligan *et al.* (2014) regarding how to incentivise construction industry players to become greener in their way of thinking and doing business.

5 CONCLUSIONS AND RECOMMENDATIONS

The adoption of green building in South Africa is relatively low, more so for certain provinces, when analysing registered and/or certified green buildings by the Green Building Council of South Africa. The study identified a number of barriers including high cost of green building materials, limited knowledge, low demand, lack of green technology and techniques, lengthy process, poor government support, lack of building codes and regulations, lack of awareness and of green material availability. Cost remains the main barrier hindering the adoption of green building in South Africa.

To optimise the adoption of green building practices and materials in construction, a number of recommendations were made. Firstly, there is a need to implement and adopt green building practices and materials in the construction industry for environmental sustainability, Secondly, organisations, councils or any other party should aim to discuss and implement possible or better green building incentive systems with the government, suppliers or any party (such as financial institutions) that can aid in availability of more financing options, economic incentives such as grants and tax rebates and availability of more affordable green building materials. Thirdly, awareness about green building, its application and practices, benefits and promotion thereof should be increased through events, seminars, awards, research and publications. The study provides useful insights into the key constraints of green building adoption, which are useful to construction industry stakeholders in developing policies, strategies and incentives to promote to achieve sustainable practices.

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