MITIGATING KEY BARRIERS TO PROMOTE SUSTAINABLE CONSTRUCTION: A THEORETICAL ASSESSMENT

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The construction industry is a significant consumer of energy, natural resources, and water, as well as a major polluter. The need to construct more facilities to meet society's needs has exacerbated the construction industry's inherent detrimental effects on achieving long-term sustainability. In order to foster these endeavors, this paper aims to mitigate sustainable construction barriers in order to promote sustainability in South Africa. To accomplish the goal, three (3) major innovative practices were identified through cross-analysis of structured interviews with reference to published theoretical literature. The primary findings indicate that (1) energy conservation, (2) material conservation, and (3) water conservation are the most influential innovative practices for reducing barriers to promoting sustainable construction in South Africa. To be considered sustainable, a building must meet certain criteria such as resource and energy efficiency, emission reduction, pollution prevention, noise reduction, and improved indoor air quality, which are some of the common parameters, and it must be based on integrated and systematic approaches. The findings of the study will benefit and will add to the body of existing knowledge of construction industry professionals, owners, and policymakers.

Keywords: Construction industry, Water conservation, Manufacturing, Material conservation, Recycle, Energy conservation.

1 INTRODUCTION

South Africa's construction industry is vital to job creation and economic growth. The industry is capable of providing superior infrastructure, which is considered necessary for the economy's growth and development as well as the general well-being of its citizens (Dithebe 2018). However, among industry stakeholders, there is widespread ignorance and unawareness about the benefits of sustainability (Aigbavboa et al. 2017). The industry is confronted with a lack of innovation and adaptability among industry stakeholders, a low demand among customers for sustainable constructional processes and projects, and the industry’s overall resistance to change (Aghimien et al. 2019). Cost involvement in the process is also a challenge because both industry stakeholders and the general public believe that shifting to sustainability would only add extra costs to construction projects. Furthermore, there is a widespread misconception that construction cost overruns exacerbate the situation. Another issue is a lack of knowledge about sustainable construction. As a result, there is a lack of demand for such structures, demotivating stakeholders from investing in sustainable buildings (Oke et al. 2016). In this context, the purpose of this
research is to conduct a literature review in order to mitigate key sustainable construction barriers in order to promote sustainability in South Africa.

2 SUSTAINABLE CONSTRUCTION

Sustainable construction is the creation and responsible management of a healthy built environment in which construction activities' negative impacts are minimized and positive impacts are maximized to achieve balance in terms of environmental, economic, and social performance (Zabihi et al. 2012). For a long time in South Africa, mass awareness about the need for sustainability in construction practices was grossly absent. Beginning in the 2000s, however, the country became more aware of the dangers of global climate change, which impacted the construction industry as well (Windapo and Cattell 2013). The South African Green Building Council (SAGBC) was established in 2007, modeled after Australia's Green Building Council. However, the Green Star South Africa rating tools were developed by the Council to recognize and reward environmentally friendly construction throughout the country (Oguntona et al. 2019). In 2013, the council awarded the Green Star SA rating to six newly constructed buildings in South Africa that met sustainability standards. Between the council's inception and 2016, 36 buildings have been awarded a Green Star rating, indicating their environmental friendliness. The South African government and non-governmental organizations established the National Framework for Green Building in South Africa (NFGBSA) in 2011 with the aim of implementing and achieving green construction in the country. Green roofing is also a popular trend in the country. Buildings are constructed with an additional roof to absorb carbon dioxide and eliminate the possibility of it polluting the outside air. The treed roof at Nelson Mandela Square's parking area in Sandton, Grace Hotels in Rosebank, House Westcliff, and Stellenbosch University's Library are just a few examples of green roof technology that has already been implemented in South Africa (Oguntona et al. 2019, Laxmipriyanka 2009). It has become even more critical that whatever is built be built on the basis of sustainability, considering all aspects of the environment, economy, and society (Patil and Patil 2017). Standards are also developed and training targets are set to ensure that the construction processes undertaken by different construction firms result in improved levels of education and environmental awareness.

3 BARRIERS IN SUSTAINABLE CONSTRUCTION

According to the research of Aigbavboa et al. (2017), despite the fact that pollution and depletion of natural resources are serious side effects of the South African construction industry, there is widespread ignorance and unawareness among industry stakeholders about the benefits of sustainability. Cost involvement is also a challenge because both industry stakeholders and the general public believe that shifting to sustainability will only increase construction project costs (Morelli 2011). Furthermore, there is a widespread misconception that construction cost overruns exacerbate the situation. A lack of motivation in the industry makes it difficult to mobilize all of the resources required to support the technological changes associated with the transition to sustainability. Oke, et al. (2016) also indicated complexities associated with sustainable construction practices in the country: incompatible legislation and environmental laws, compatibility of sustainable construction practices with existing practices; and a lack of innovation and adaptability among industry stakeholders. Another issue is a lack of knowledge about sustainable construction. As a result, there is a lack of demand for such structures, which demotivates stakeholders from investing in sustainable structures (Oguntona et al. 2019). Furthermore, industry stakeholders are resistant to change and are hesitant to transition from traditional construction practices to sustainable measures (Aghimien et al. 2019).
3.1 Mitigating Barriers to Promote Sustainable Construction

The construction industry is an important component of any society, and it has a significant environmental impact. The construction industry is a major polluter and consumes the most energy, natural resources, and water (Windapo and Cattell 2013). Because of its significant impact, there is growing consensus among organizations committed to improving environmental performance to take immediate steps and actions that can make the sector more sustainable. A building must meet certain criteria in order to be considered sustainable, including resource and energy efficiency, emission reduction, pollution prevention, noise reduction, and improved indoor air quality (Kibert 2013). The section that follows suggests specific methods or innovative practices that can be implemented in the construction sector to move one step closer to mitigating barriers and achieving sustainability.

3.2 Energy Conservation

The construction industry is a major energy user, which is a major contributor to environmental issues. Every stage of the construction process, from design to operations and finally demolition, consumes energy. The primary goal here should be to reduce fossil fuel consumption while increasing the use of renewable energy resources.

- Choosing low-embodied energy materials, for example, can help construction companies reduce energy consumption during processes like mining, processing, manufacturing, and material transportation. Furthermore, materials with a high embodied energy are common. As a result, construction companies that value sustainable construction will consider such factors (Banerjee 2015).
- Construction industries can choose low-energy-intensive transportation, which can significantly reduce emissions by reducing the amount of fuel used. Furthermore, the construction industry can significantly reduce energy consumption by using energy-efficient technological processes for building construction, fit-out, and maintenance, and by having a fully integrated approach from the start of the project (Tandale and Rao 2007).
- Increasing the use of passive energy design elements, such as natural ventilation, can help achieve thermal and visual comfort in buildings. Furthermore, architects and designers must consider the site's macro and microclimates as solar passive and bioclimatic design can aid in energy conservation (Banerjee 2015).

3.3 Material Conservation

Natural bio-diversity is directly impacted by the extraction or consumption of natural resources used in buildings as raw materials or for manufacturing purposes, owing primarily to the fragmentation of natural areas and ecosystems caused by construction activities. Furthermore, many minerals used in construction are non-renewable. As a result, it is necessary to reduce consumption of both renewable and nonrenewable resources. During the planning and design phases, considerations should be kept in mind, with the environmental impact of each material used being taken into account. The primary emphasis is on strategies for improving material efficiency.

- Waste reduction: Reducing waste generation can help to significantly reduce the use of nonrenewable resources. Waste minimization can be achieved by addressing this issue as a critical part of the sustainability agenda throughout the entire construction process and adhering to three key waste reduction principles, which include reducing, reusing, and recycling, as well as appropriate construction waste disposal. Building designers play a significant role in achieving this goal (Evans 2017).
Reducing and recovering construction waste: First and foremost, construction companies can reduce their environmental impact by avoiding waste generation, which helps them gain additional economic benefits. Recovery lowers greenhouse gas emissions while also saving energy. For this reason, the recovery of energy and materials from waste has been identified as an important strategy for dealing with energy crises (Dogaru 2013).

Reuse and recycling: reintroducing construction materials into the manufacturing process can undeniably help to reduce the overall environmental impact. Reusing and recycling materials can be a cost-effective way to reduce waste, resulting in significant waste reduction (Nindyati 2014).

Storage and disposal of construction waste: In cases where construction companies are able to prevent or recover waste, it is also necessary to store it properly and keep it in a controlled environment. Furthermore, the decision on waste that can be disposed of in landfills should be based on a site-specific risk assessment (Nindyati 2014).

Construction firms help to avoid many environmental health issues by providing occupants with good indoor air quality to live in by using building materials with lower levels of toxic substances (Evans 2017).

3.4 Water Conservation

Water depletion has emerged as a major environmental issue. And the construction industry has a more visible impact on it. The amount of water used in building operations accounts for a significant portion of total consumption. Furthermore, a large amount of water is used during the extraction, production, manufacturing, and on-site construction processes. But water conservation technologies continue to be the most overlooked aspect of the entire construction process (Kumari and Singh 2016). The following section will go over some methods that can help with water conservation.

- Water waste can be reduced by using water-efficient plumbing materials such as low-flow toilets and urinals, low-flow and certified sinks, low-flow showerheads, and appliances such as water-efficient dishwashers (Tsai et al. 2011).
- Choose dual plumbing where recycled water can be used for toilet flushing or a gray water system that helps recover rainwater. Gray water is typically the result of activities such as hand washing and thus does not necessitate extensive treatment. Recycled water can be used to flush toilets (Kumari and Singh 2016).
- Using a re-circulating system with centralized hot water distribution aids in water conservation (Nindyati 2014).
- Low-demand landscaping also helps to reduce water consumption on sites, as plants have generally adapted to local rainwater levels. Water efficiency can also be improved by installing an underground drip irrigation system, which reduces evaporation loss (Tsai et al. 2011).

4 RESEARCH METHODOLOGY

The study was conducted with reference to existing published theoretical literature through a systematic literature review. The study is primarily a review of literature on mitigating key barriers to promote sustainable construction in South Africa. Furthermore, the research was based on conference papers, proceedings dissertations, and journals. The study used a qualitative research approach in order to achieve the aims and objectives.
5 LESSON LEARNT

According to the findings of the study, mitigating sustainable construction barriers to promote sustainability is a challenging task. Some of the common factors that create a challenging working environment include widespread ignorance and unawareness among industry stakeholders, financial costs, a lack of knowledge about sustainable construction practices, complexities, incompatible legislation and environmental laws, and a lack of innovation and adaptability among industry stakeholders. Furthermore, industry stakeholders are resistant to change and are hesitant to transition to sustainable measures from their traditional construction practices, especially given that they have contributed to maximizing profits, which has frequently prevented the industry from adopting environmentally friendly practices and solutions. However, studies have shown that energy conservation, material conservation, and water conservation are potential innovative practices that can be implemented in the construction sector to help mitigate challenges and achieve sustainability. Better quality of life through a variety of benefits such as increased health safety measures, increased productivity, better surroundings, quality reduction in greenhouse emissions, minimization of air pollution, and effective use of energy resources are benefits that South Africa will reap. All of these changes will be costly and time-consuming to implement. Despite the numerous barriers, the study suggests that organizations and nations can turn a crisis into an opportunity by expanding their understanding of classical construction beyond current consumer demands (Zabihi et al. 2012). Furthermore, increased financing for the sector, green construction education and training, improved government support and intervention, and improved multidisciplinary collaboration among construction industry stakeholders are key drivers in the process toward sustainability in the construction industry. This can only be accomplished with the collaboration of the community, government, and the sector itself.

6 CONCLUSION

The study examined the literature on mitigating key barriers to promoting sustainable construction in South Africa. Following that, it was discovered that there are several barriers or challenges impeding sustainable construction, such as widespread ignorance and unawareness among industry stakeholders, financial costs, a lack of knowledge about sustainable construction practices, complexities, incompatible legislation and environmental laws, and a lack of innovation and adaptability among industry stakeholders. As a result, the study recommends that energy conservation, water conservation, and material conservation be implemented as potential innovative practices in the construction sector to help mitigate the challenges. Furthermore, the process will benefit South Africa by improving quality of life, increasing health and safety, increasing productivity, improving the environment, reducing air pollution, and using resources more efficiently and effectively. Even though related literature review papers and research in the area have already been conducted, research on mitigating key barriers to promote sustainable construction in South Africa is considered necessary because one of the major causes of such an imbalance is that most people are not completely aware of what exactly sustainable construction is, and many are not realizing its full potential as it is a relatively new concept. Future research could focus on the challenges presented by incompatible legislation and environmental laws in achieving sustainable construction.

Acknowledgments

I'm extremely grateful to my supervisor, Dr. Molusiwa Ramabodu, and co-supervisor, Ms. Nokulunga, for their insightful comments and suggestions, which were incorporated into the final version of the paper.
Special thanks go to the Cooper family and the University of Johannesburg's Faculty of Engineering and the Built Environment.

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