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Barriers to Sustainable Construction Practices in the Zambian Construction Industry

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Abstract

Construction activities have been established to be posing a great danger to the environment. In a bid to curtail these negative happenings the call for sustainability in construction has become popular. Construction industries around the world are advised to build in a manner in which no harm is done to the environment, and the future generation can have enough to cater for their own needs. However, sustainable construction (SC) practices adoption, has been observed to be low in most developing countries. It is based on this knowing that this study assessed the barriers to SC practices within the Zambian Construction Industry (ZCI). The study adopted a survey approach and construction professionals within the ZCI were sampled using the questionnaire as a research instrument. Descriptive statistics tools were employed in analyzing the gathered data. Findings revealed that the major barriers to SC practices in ZCI are; fear of higher investment costs, no local green certification available, lack of government policies or support, and lack of financial incentives. Therefore educating construction clients and other stakeholders on the overall life-cycle cost benefit of SC is deemed necessary.

Keywords

Construction projects, Sustainable Construction Practices, Sustainable Development, Sustainability, Zambian Construction Industry.

1. Introduction

Construction projects in most developing countries have been characterized with poor performance in terms of sustainability. This is in contrast to the clamor for a more sustainable environment; one that is achieved through sustainable construction (SC); a construction that satisfies the present needs with jeopardizing the ability of future generations to satisfy their own needs. Ametepey and Aigbavboa (2014) observed that scientists and scholars are now increasingly aware of the fact that the earth's resources are being overly consumed and this most like will erode the earth's support system. This consumption is traceable largely to the activities of the construction industry. Baloi (2003) observed that although the construction industry is crucial in the social and economic growth of any country, it has come to be known for its heavy contribution towards unsustainable development, and its impact on both the economy and the environment is tremendous. The processes and products used in the traditional construction approach have a negative environmental and social impact. The activities consume massive quantities of natural resources including numerous energy sources and water. Extraction of raw materials, manufacturing, and transportation tend to lead to a reduction of resources and losses of biological diversity whilst acid rain and global warming is the result of high energy consumption.

In response to the unhealthy situation, SC was proposed as a way of making the construction processes, activities and practices more economically, socially and environmentally responsive (Abidin, 2010). This was motivated by

the goal of securing the future generation's ability to satisfy their needs, through the application of sustainable development principles in delivering present needs. Considering the constant call for sustainable construction, it is important for Zambia to keep pace with this global movement by adopting sustainable construction practices. Unfortunately, just like other developing countries, the Zambian Construction Industry (ZCI) suffers from poor construction delivery in terms of SC (James and Matipa, 2004). While there are evidence of studies conducted to ascertain the factors affecting the adoption and full implementation of SC in developing countries around the world, (Aghimien *et al.,* 2018; Aigbavboa *et al.,* 2017; Alsanad, 2015; Ametepey *et al.*, 2015; Ayarkwa *et al.,* 2017; Djokoto *et al.*, 2014), not much has surfaced as regards studies on the factors affecting the SC in Zambia. These factors can be seen as barriers deterring the attainment of SC projects by the ZCI. Identifying and understanding these barriers is therefore crucial if SC is to be achieved within the country. It based on this knowledge, that this study assessed the barriers of SC practices in the ZCI, with a view towards proffering possible solutions to overcoming these barriers and achieving SC projects in the country. The subsequent parts of the paper include the review of literature relating to the subject matter, the methodology used, and the results and findings. Based on the findings, conclusions were drawn, and necessary recommendations were made thereof.

2. Literature Review

2.1 Construction in Zambia

The construction industry is vital in the development of the Zambian economy. Activities in the sector in the last couple of years have been driven by public and private projects which include construction of hospitals, roads, schools, stadia and commercial and residential property. The industry has continued to grow over the last 12 years at a steady annual average rate of 17.5 percent. This growth is because of the increased public and private sector investment on infrastructure development (Seventh National Development Plan, 2017). Despite the growth experienced by the construction industry, Zambia like other developing countries still faces challenges like inadequate housing, rapid urbanization and lack of infrastructure (Du Plessis, 2002). In addition, the construction industry suffers from a rise in project costs due to the rise in prices of raw materials, labour and depreciation of the local currency. Another issue that has emerged is that the major sectors spearheading the economy; construction and mining have impacted negatively on the environment, and evidence of this is in land degradation, high energy consumption, and pollution. To mitigate this situation, the construction industry has been identified as a vehicle towards greening the economy. The industry has responded through initiatives like the Zambia Green Jobs Programme (ZGJP) which has partnered with several organizations like the National Council of Construction (NCC).

2.2 Sustainability in Construction

The sustainability paradigm shift has gained momentum over the last few years as established by Kibert (2013). This is as a result of the effects of climate change being experienced at alarming rates, coupled with increased food and energy prices, natural disasters and financial crises. Sustainability is that which is capable of being maintained and from the ecological perspective the exploitation of the earth's resources to a certain degree without harmful effects. Du Plessis (2002) defined sustainability as the state or condition that would enable the continued existence of human beings. It is a goal that every human being aims to achieve despite the external and internal changes. It is out of this general context of sustainability that the term sustainable development (SD) arose. One of the popular definitions is that penned down by the Brundtland Report (1987) which states that the present needs should be met without jeopardizing the future generation's ability to meet their own needs. SD has been understood to be the continual development that humans must continue to pursue to attain the state of sustainability. It is thus a continuous process that requires achieving a balance between human demands and what is ecologically possible.

The term "Sustainable Construction" (SC) has become crucial in achieving SD. Akbiyikli *et al.* (2009) stated that SC can be seen as a pathway through which the built environment industries can move towards SD, bearing in mind the environmental, socio-economic and cultural pillars. Chaharbaghi and Willis (1999) have earlier stated that SD is a concept based on a structure which stands on three pillars, namely social, environmental, and economic pillars. Oke *et al*. (2015) therefore submitted that sustainability in construction project delivery is a way of creating a balance between economic, environmental and social factors in construction. Based on these submissions, Aghimien *et al*. (2016) describe SC as the delivery of construction projects that encourages the preservation of the natural habitat; promotes the social well-being of the occupants; and provides a reasonable economic stand for the investors. Bal *et al*. (2013) also stated that construction project is said to be sustainable when environmental challenges are

met, social and cultural demands are responded to, and economic improvement are delivered by such project. According to Du Plessis (2002), SC is an all-inclusive process with the aim of re-establishing and maintaining accord between the built and natural environments, and the creation of settlements that values human dignity, and promote economic equity. This definition implies that SC takes a lifecycle perspective with emphasis on environmentally orientated design, operation and maintenance procedures.

2.3 Barriers to Sustainable Construction

SC in most developing countries around the world has been characterized as poor. Studies have shown that the sustainability level in construction projects being delivered in these developing countries is low, and Zambia is no exception (Alabi, 2012; Aje, 2016; Baron and Donath, 2016; James and Matipa, 2004). Several factors have been held accountable for this poor SC in these countries, and it is only through the understanding of these factors, that effective measures can be put in place to overcome them and achieve SC within the built environment. These factors have been described as barriers impeding the achievement of SC. Vandierendonck *et al.* (2010) referred to barriers as characteristics and situations that can hinder actions or impede progress towards achieving certain objectives (in this case achieving SC). Ayarkwa *et al.* (2017) stated that barriers have a negative impact on the implementation of SC practices, and they can be internal or external factors.

Davies and Davies (2017) submitted that the implementation of SC in Nigeria is hampered by the construction industry's inability to relinquish the traditional methods of construction. In a similar vein, Aghimien *et al.* (2018) studied the challenges of sustainable construction in the country using educational buildings as a case study and observed that the major SC barrier in the country is construction related. The study noted that if SC is to be fully achieved within the country, then the construction industry must be ready to jettison the traditional method of construction for more innovative sustainability oriented methods.

Kibert (2008) identified the perceived higher first costs as one of the barriers to the adoption of SC. In agreement Ametepey *et al.* (2015) and Häkkinen and Belloni (2011) pointed that SC is feared to be more expensive and can amount to higher investment costs when compared to the traditional construction. Clients are also deterred from embracing SC due to concerns of higher risks based on the lack of previous experience, unfamiliar techniques, the need for additional testing and inspection, and lack of support from both manufacturers and suppliers. To aid the promotion of SC, Shi *et al*. (2013) suggested that life-cycle cost (LCC) should be incorporated during the assessment of the various costs and their implications. Hydes and Creech, (2000) argued that the higher costs attached to SC are because of increased consultants' fees, overestimating of costs of energy efficient measures, and underestimating the possible cost savings. Other factors associated with cost are the lack of promotion of financial incentives and innovative fiscal instruments that would help to cushion the higher first costs which can be recovered through increased rentals (Serpell *et al*., 2013; Sodagar and Fieldson, 2007).

According to Powmya and Abidin (2014), the government is key in the enforcement of regulation, revision of existing legislation and policies, the introduction of building codes, incentives, and other fiscal instruments to spearhead SC adoption . The lack of commitment by the government will hamper the implementation of SC. In agreement, Häkkinen and Belloni (2011) identified building codes and regulations among other mechanisms that would steer the adoption of SC. It was further stated that the absence of these would hinder the adoption of SC. Djokoto *et al.* (2014) cemented the observations of other scholars by stating that policy formulation would drive the SC movement through the provision of clarity on the existing policy framework and it would serve as an indicator of the government's future direction on SC. These policies would help to bring the fragmented construction with its various stakeholders together.

William and Dair (2012) identified lack of knowledge, understanding, and information as the major barriers to the delivery of sustainable structures. In addition, Whang and Kim (2015) posited that the key to successful implementation of SC is in the contractor's awareness regarding sustainability and also on his performance. In a similar vein, some scholars Opoku and Ahmed (2015) recognized the importance of public awareness and proper knowledge and understanding of sustainability as being essential to the successful promotion of SC practices in the various construction organizations. Alabi (2012) observed a low level of awareness of the concept of sustainability among construction participants in Nigeria. Similarly, Aghimien *et al.* (2018) noted that sustainability awareness and the knowledge related factor is the second most crucial barrier to SC in the country. In Kuwait, Alsanad (2015) also discovered that SC implementation is low, and this can be as a result of lack of awareness of SC concept in the country. Baron and Donath (2016) on the other hand observed although there is considerable awareness of the concept of SC in Ethiopia the major barrier SC faces is incorrect implementation. It was observed that SC in the country in most cases is either completely neglected due to budget constraints, lack of alternative building materials,

or knowledge, or it is reduced to the issue of sustainable resource management. Aghimien *et al*. (2018) therefore concludes that the poor understanding of the concept of SC in its holistic form can be a major barrier towards achieving SC.

According to economic principles, where there is demand, it naturally leads to an increase in supply. With that in mind Pitt *et al*. (2009) and Powmya and Abidin (2014) posited that if there is an increase in demand for SC from the clients, buyers, and users, there will be an improvement in the number of structures that are completed using SC practices. In agreement Häkkinen and Belloni (2014) identified that the demand and willingness of the client are key to the development of SC; this is because of the link between demand and other important segments like supply, value, and cost. An additional factor determined by Du Plessis (2002) is the low interest in sustainability-related issues on the part of construction clients and other stakeholders. This is caused by the ignorance by the developers and contractors of the benefits like competitive advantage, which can be drawn from adopting SC. Pitt *et al*. (2009) submitted that educating the client and other construction stakeholders would go a long way in raising awareness and increasing demand for SC practices. The construction industry needs to take the lead in guiding construction clients and other stakeholders on sustainability issues and educating them on its inherent benefits. Also, Du Plessis (2002:37) observed that developing countries require knowledge and technology that will suit their natural resources as compared to that which they obtain from industrialized countries. In the same vein, Gomes and Silva (2007) in their study in Latin America found that the local research community is not helping to accelerate the implementation of SC due to lack of coordination of research activities.

Du Plessis (2002) and Opoku and Ahmed (2015) found that there is a shortage of skilled employees with the expertise of SC. This is because in developing countries many projects are carried out by small firms who outsource personnel when required. The result of this is poor skilled workers training and retention. The impact of this can be seen in the use of old management and construction practices handed down from colonial times. Aside from skill shortage, Shi *et al.* (2013) identified that green materials are essential to the attainment of SC. Their use has been hampered by the uncertainty of their performance. In addition, the green material supply chain presents other challenges. Firstly, the materials are often expensive and stakeholder conflicts of interest can result in uncertainties and loss of trust ensues. Secondly, there is no database with a list of suppliers. Davis and Davis (2017) submitted that most SC projects faced difficulty in sourcing green products locally like advanced glazing systems and were thus forced to import. One other factor observed by Mousa (2015) was that the client-driven nature of the industry leaves little or no room at all for the use of sustainable products. This is based on the fact that clients with insufficient knowledge on SC in most cases do not welcome the idea of alternative materials that are not commonly used. This tends to result in fewer sustainable solutions offered at high prices due to lack of interest from consumers and lack of healthy competition.

3. Research Methodology

The study assessed the barriers to SC practices within the ZCI. A quantitative approach using a structured questionnaire administered on construction professionals was adopted. These construction professionals include; Architects, Construction managers, Engineers, Project Managers, and Quantity Surveyors. These professionals were selected from the private and public sectors in Lusaka, the capital city of Zambia. The city was selected based on its central location and because it provides administrative functions to the entire country. In addition, the city is the center of the provision of high order services such as financial and technical services, construction and even manufacturing activities (Mulenga, 2003). The target construction professionals were those registered with the various professional bodies in Zambia and in other parts of the Southern Africa region. This measure was considered vital for the survey to ensure that the results obtained are an accurate reflection of the populations' view with regards to barriers to SC practices in Zambia.

Seventy-five (75) construction professionals participated in the study, while the instrument for data collection was a closed-end questionnaire designed in two sections. The first section was designed to harness information on the background of the respondents, while the second part harness information on the significant barriers to the adoption of SC practices within the ZCI. For questions on the second section, a 5 point Likert scale was adopted, with 5 being very significant, 4 being significant, 3 being average, 2 being low, and 1 being very low. Forty-four (44) out of the 75 questionnaires sent out were received and were ascertained fit for analyses. This represents a 59% response rate and was deemed adequate for the study. The percentage was used to analyze the data gathered on the background information of the respondents, while Mean Item Score (MIS) was used to rank the different barriers. In order to test

the nature of the data gathered, normality test was conducted using Shapiro-Wilk normality test since the sample size of was less than 2000 as suggested by Ghasemi and Zahediasi (2012). Result revealed that the assessed barriers have a significant p-value of 0.00 which is below the 0.05 threshold for a data to be ascertained as normal. Thus the data gathered are non-parametric in nature; hence, Kruskal-Walis H-Test which is a non-parametric test was employed in testing the statistically significant difference in the view of the different construction professionals that took part in the study. The internal consistency of the instrument was tested using the Cronbach's alpha test which gives a range of value of between 0 and 1, and the higher value, the higher degree of internal consistency. The Cronbach's alpha value of 0.925 was derived which implies that the instrument used is reliable.

4. Findings and Discussions

4.1 Background Information

Analysis of the background information on Table 1 shows that the professionals involved in the study were 14% Architects, 30% Quantity Surveyors, 39% Engineers, 16% Construction Managers, and 2% project managers. The study further indicated that 41% of the respondents were government employees whilst 59% of the respondents were employees of private organizations. Furthermore, 11% of the respondents had a diploma, 57% had a degree, 30% had a master's degree, and 2% had a doctoral degree. The respondents have averages year of experience of 6 years. This indicated that the professionals had a considerable level of experience to give significant answers to the questions of the research.

Table 1: Background information

Category	Classification	Frequency	Percentage
Profession of Respondents	Architect	6	14
	Quantity Surveyor	13	30
	Engineer	17	38
	Construction Manager	7	16
	Project Manager	1	2
	Total	44	100
Sector	Public	18	41
	Private	26	59
	Total	44	100
Academic Qualification	Post-Matric Diploma or certificate	5	11
	Baccalaureate Degree	25	57
	Master Degree	13	30
	Doctorate	1	2
	Total	44	100.0
Years of experience	1-3 years	5	11
	4-6 years	16	36
	7-10 years	8	18
	11 and more years	15	34
	Total	44	100
	Average	6	

4.2 Barriers to Sustainable Construction Practices

In assessing the barriers of SC practices ZCI, some barriers were identified from the review of related. The respondents were asked to rate these identified barriers based on their significance. Result in Table 2 shows the ranking of these identified barriers to SC practices, their mean value, and associated significant p-value derived from Kruskal-Wallis H-Test conducted. The result from the Kruskal-Wallis Test shows that at 95% confidence level, no significant difference exists in the view of the construction professionals with regards to the identified barriers. A significant p-value of above 0.05 was derived for all the assessed barriers. A quick look at the table shows all assessed variables having a mean value of above average of 3.0. This means that to a considerable extent all the assessed barriers play a significant role in deterring the effective implementation SC practices within the ZCI. The most significant of these barriers are; fear of higher investment costs, no local green certification available, lack of

government policies or support, and lack of financial incentives with a mean value of 4.05, 4.02, 4.00 and 4.00 respectively.

This result implies that with Zambia being a developing country, clients most times will tend to be conservative with the little finance they have. Achieving construction projects higher than the expected budget would be unacceptable to them. Thus, the fear of SC having higher investment cost is bound to be a barrier towards their embracing of this concept. However, Aigbavboa *et al.* (2017) stated that the idea that SC has higher investment cost is more of an assumption made without thorough analyses of the overall life-cycle cost by construction participants. This assumption was described as a "lazy view" of construction participants. A similar observation was made by Miranda and Marulanda (2001) where it was discovered that the major barrier to SC in Peru, is the fact that it is being perceived as a concept which would add to the project cost. It has been observed that this view poses a big challenge in the adoption of SC practices in most developing countries around the world (Lowe and Zhou, 2003). This finding is in line with the submission of Ametepey *et al.* (2015), Kibert (2008), and Häkkinen and Belloni (2014) who found that the fear of higher investment costs is a crucial barrier affecting the adoption of SC practices in most developing countries around the world.

Also, the lack of green certification within the country is deterring the adoption of SC practices as there is nothing to guide construction professionals towards achieving green buildings. This leads to the issue of lack of government policies and support which is seen as another major barrier within the ZCI. It has been stated that government plays a key role in the enforcement of regulation, revision of existing legislation and policies, the introduction of building codes, incentives and other fiscal instruments to spearhead SC adoption (Powmya and Abidin (2014). If the government were to fail in this capacity, it will be posing a grave danger to the implementation of SC practices. Findings of this study are in line with the submissions of Aghimien *et al*. (2018), Alsanad (2015), Ametepey *et al.* (2015), and Osaily (2010) that lack of government policies and support is one of the barriers of SC in Nigeria, Kuwait, Ghana, and Palestine. This implies that if SC is to be achieved in Zambia, then the government must be proactive in championing this course, as suggested by the Joint International Conference (2016).

Although the findings of this study follow the trend of results from previous studies in other developing countries around the world, it is however in contrast with the findings of some research. For example, the major findings of Aghimien *et al.* (2018) show that construction-related barriers are the most significant barriers to the adoption of SC practices within the Nigerian Construction Industry. However, findings from this study point to the perceived increase in cost if SC practices are adopted. The disparity in these two studies can be as a result of the method of construction activities being carried out in both countries. These construction activities, therefore, merit second reflection. Also, the finding of this study differs significantly with the study conducted in Kuwait by Alsand (2015), where lack of awareness was found to be the main obstacle to the adoption of SC practices. This present study reveals that lack of awareness and knowledge of SC practices among construction professionals within the ZCI are the least barriers to the adoption of SC practices within the ZCI. This, therefore, shows that the sustainability issue in Zambia is not that of awareness but proper implementation. A similar observation made by Baron and Donath (2016) in their SC assessment of Ethiopia.

Table 2: Barriers to adopting sustainable construction practices

Barriers	MIS	Rank	Chi.Sq.	Sig.
Fear of higher investment costs	4.05	1	2.550	0.769
No local green certification available	4.02	2	3.301	0.654
Lack of government policies or support	4.00	3	3.664	0.599
Lack of financial incentives	4.00	3	6.244	0.283
Lack of government commitment	3.98	5	3.605	0.608
Ignorance of life cycle costing	3.98	6	3.882	0.566
Fear of long pay-back period	3.98	6	8.093	0.151
Client worries on profitability	3.93	8	7.448	0.189
Lack of easily accessible guidance	3.89	9	5.917	0.314
Lack of building codes on sustainability	3.86	10	1.713	0.887
Delay in decision making	3.84	11	9.558	0.089
Lack of demand for sustainable products and cultural resistance to change	3.82	12	4.253	0.514
Lack of leadership	3.82	12	2.557	0.768
Lack of motivation and aspiration values of managers	3.80	14	4.749	0.447

Lack of market segmentation	3.77	15	3.020	0.697
Lack of ideal demonstration project	3.77	15	5.387	0.371
Lack of legislation	3.75	17	3.300	0.654
Lack of sustainability measurement tools	3.73	18	6.114	0.295
Lack of interest in the issue of sustainability	3.66	19	4.489	0.481
Lack of environmentally sustainable materials	3.57	20	7.862	0.164
Ignorance or misunderstanding about sustainability	3.52	21	3.140	0.678
Lack of awareness of benefits	3.52	21	5.156	0.397
Lack of technical ability and chronic skills and labour shortage	3.52	21	6.897	0.228
Lack of education and knowledge in sustainable design	3.50	24	6.393	0.270
Lack of awareness of professionals	3.36	25	5.811	0.325
Lack of professional knowledge	3.30	26	5.811	0.325

5. Conclusion

This study set out to assess the barriers to SC practices within the ZCI. The study through the survey of the view of construction professionals within the country's construction industry has been able to ascertain the most significant barriers impeding the full implementation of SC practices in Zambia. Base on the findings, the study concludes that the most significant barriers of SC practices in ZCI are fear of higher investment costs, the absence of local green certification, lack of government policies and support, and lack of financial incentives. The study, therefore, recommends that since the fear of high investment cost is the most significant barrier, educating construction clients and other stakeholders on the overall life-cycle cost benefit of SC is necessary. This can be done through organizing seminars, workshops and other public functions geared towards enlightening the public as regards the benefits of building sustainably. Through this, clients fear with regards to the cost of SC can also be alienated. In a similar vein, the government can help by promoting the development of a framework for the adoption of SC practices in all construction activities in the country. The government needs to show its commitment to the adoption of SC through the introduction of legislation, and incentives. This study has been able to contribute to the body of knowledge as it brings to light the most crucial factors that are affecting the proper adoption of SC practices in Zambia. It is believed that if the findings and recommendations of this study are considered and implemented, the study will go a long way in contributing to the adoption of SC practices within the country.

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