Capacity of professionals in delivering sustainable construction in Nigeria

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Abstract. Construction activities greatly contribute to environmental degradation and increased carbon footprint in the atmosphere. The need to mitigate these impacts has instigated the adoption of sustainable practices such as green building in various developed and rapidly developing countries. This study, therefore, measures the knowledge of Nigerian built environment professionals in the field of sustainable construction with a view to appraise how the local construction industry is performing in delivering sustainable development. The scope of the research is delimited to the construction professionals in Ondo state, Nigeria. This research adopted the survey research design and descriptive statistic was used to analyze the data which was sourced from the construction professionals via a close-ended questionnaire. Findings from the study revealed that a substantial percentage of the construction professionals in the study area do not really understand the fundamentals of sustainable construction practices thus impeding them from deploying it to construction projects. It is therefore recommended that efforts should be intensified in educating and developing construction professionals on the practicability of sustainable construction, so they can fully exploit the technology and ensure sustainability in the built environment.

Keywords. Construction professionals; Green building; Sustainable development; Sustainable construction; Nigerian construction industry.

1. Study Background
Akinshippe [1] submitted that the concept of sustainable construction and development was initiated to limit the adverse effects of man’s activities on the environment. As stated by Woolley [2] the greatest destructive activity of the natural physical environment is construction. This is because construction consumes a great deal of natural resources; amass abundant waste as well as pollutes water, land, and air which disrupts the natural balance of the ecosystem [3]. Studies such as that of Ahn [4] and Pearce [5] established that construction is a major threat to environmental prosperity as it contributes largely to ozone layer depletion; global warming; climate change; soil erosion; land pollution; deforestation; desertification and the depletion of precious minerals.

To successfully achieve sustainability in any country, all construction stakeholders must be fully dedicated to the idea of adopting sustainable development; encourage sustainability through sharing innovative technologies and best practices; as well as ensure that an enabling environment is created to foster the cause [6]. Previous studies such as that of Ahn [4]; Gou [7]; and Akinshipe [1] has established...
that sustainable construction has been forecasted to be an integral part of the construction industry’s future. In order to achieve sustainability goals in the built environment, construction professionals are applying green principles into the design, execution and management stages of buildings. The application of these green principles and tools will optimize energy consumption, indoor air quality and use of resources [8]. Green building is the foundation of sustainable construction and a significant technique in attaining comprehensive sustainable development. There is a constant demand for sustainable development which can only be realized through sustainable construction; that is, the ability of the present generation to produce desired construction projects without threatening the needs of the future generation [9].

Within the construction industry, sustainable construction is the only means by which global environmental sustainability can be achieved. Over the years, developed countries such as Singapore, Japan, Germany, USA, Korea, and the UK have fully incorporated the concept into everyday construction projects. At the same time, because of the complexity in full adoption, some countries employ individual features of sustainable construction as needed. However, other countries are still considering the concept and gradually leaning towards its adoption [10]. For instance, Nobe [11]; and DuBose [12] observed that in the US and UK, numerous government organisations and department requires a minimum green standard for its buildings and has also obliged that all future building should be fully green. Furthermore, in Darko [13] studies which was conducted in Ghana, it was observed that Ghana is one of the very few developing African nations that is making commendable progress in adopting and implementing sustainable construction. The study recounted that the first LEEDS-certified sustainable hospital in Africa, Ridge Hospital and West Africa’s first fully green commercial building complex, the One Airport Square are both located in Accra, Ghana. This established that Ghana has certainly taken a decisive lead in adapting to sustainable construction in West Africa and Africa as a whole. Oyeshola [14] pointed out that Nigeria as part of the international community must contribute its quota to ensure that the global environment remains fit to adequately and continuously support life. In light of this, Adejumo [15] study concluded that the government of individual countries must postulate policies that will enhance the adoption and implementation of sustainable development.

Adejumo [15] posited that sustainability is an issue that cut across all areas of life and there is a substantial need to create as much awareness on the subject as possible. CIB [16] as later cited in Kibert [17] and Oni [18] postulated the seven principles of employing sustainable construction which is; decreasing resource usage; using recyclable resources; reusing resources; environmental care; eliminating toxic waste; reducing cost; and lastly, focusing on quality. In retrospect, the application of sustainable principles in buildings must start from the conception stage to the deconstruction stage [18]. Studies conducted by Akinshipe [1] concluded that construction professionals must be savvy in the essential knowledge and skills required to design, execute and manage sustainable buildings to meet the needs of the generation yet unborn. Hence, this study seeks to measure the knowledge of Nigerian built environment professionals in the field of sustainable construction with a view to appraise how the local construction industry is performing in delivering sustainable development.

2. Design and Method
The background of this study has identified the aim and benefits of sustainable development and construction. It further revealed the different avenues by which sustainable construction practices could be adopted. Since the study is aimed at appraising how the local construction industry is performing in delivering sustainable development by measuring the knowledge of the built environment professionals in the field of sustainable construction. The study was, therefore, divided into two sections; the first was to measure how knowledgeable construction professionals are in sustainable construction; while the second was to measure how often sustainable construction practices are employed during project planning and implementation.

In view of this, the study was channelled to follow a descriptive nature. The quantitative model was adopted and thus survey was the appropriate tool for collecting the primary data for this study. A five-point Likert scale structured questionnaire was used to collect data with the sole objective of achieving the aim of the study. Primary data was sourced from built environment professionals in Ondo State, Nigeria. A total of 125 questionnaires were distributed, while 82 was retrieved, only 78 questionnaires
were deemed useable for this study after they were checked for completeness. The data collected through the questionnaire were analysed using mean item score (MIS) and presented in tables as shown in the succeeding section of this paper.

3. Result and Discussion

Background data collected revealed that 26.9% of the respondents are Builders/Contractors/Construction Managers; 21.8% are Quantity Surveyors; 20.5% are Estate Surveyors; 19.2% are Architects and 11.5% are Civil Engineers. Distribution of the respondents based on the length of work experience in the construction industry shows that 37.2% has less than 5 years of experience; 33.3% has 6-10 years of experience; 24.4% has 11-15 years of experience while 5.1% has above 15 years of experience in the construction industry. Meanwhile, 42.3% of the respondents work in a Government department or agency, 32.1% of the respondents work for Consulting firms while 25.6% of the respondents work for Contracting firms. The background information shows that the population distribution of the sample size in this study evenly cut across different professions, sector engagement and years of work experience.

Table 1 reveals the respondents’ knowledge in various areas of sustainable construction. Based on the information provided by them, Basic understanding of sustainability was ranked 1st with a mean score of 3.08. In the same way, green agenda was ranked 2nd with a mean score of 3.00. Sustainable building methods and materials, management of sustainable efforts and application of sustainable practice in project respectively occupied 3rd, 4th and 5th position in the table above. The knowledge of the respondents in the understanding of energy efficient systems, sustainable construction and its techniques, green building design principles and green building rating system were ranked least as they occupy 6th, 7th, 8th and 9th positions respectively.

Based on the foregoing it could be inferred that the construction professionals are only knowledgeable in the basic understanding of sustainability and the green agenda. However, it is obvious that most of the construction professionals in the study area have little or no knowledge of the basic ingredients of sustainable construction thus impeding the adoption of sustainability in the built environment. The findings corroborate the conclusion of Adejumo [15] where it was revealed that most of the construction professionals in the developing countries are not equipped with the basic knowledge needed to bring sustainability to construction, hence the need for sensitization at various levels.

Table 2 is based on the various sustainable elements the construction professionals take into consideration when engaging in construction projects. Indoor environmental quality as one of the elements with a mean score of 3.92 is majorly considered by the professionals. In the same way, green
area and environmental analysis were ranked 2nd and 3rd respectively with a mean score of 3.67 and 3.54 respectively. Water efficiency occupies 5th position on the table, also sustainable materials, energy conservation, sustainable design, nanotechnology, and smart grid are elements least considered by the construction professionals during project conceptualization, design, execution, and management.

Table 2. Frequency of implementation of sustainable construction practices in construction projects

| S/N | Item                                   | Standard deviation | Mean  | Rank |
|-----|----------------------------------------|--------------------|-------|------|
| 1.  | Indoor environmental quality           | 0.964              | 3.92  | 1st  |
| 2.  | Green area                             | 0.658              | 3.67  | 2nd  |
| 3.  | Environmental analysis                 | 1.041              | 3.54  | 3rd  |
| 4.  | Water Efficiency                       | 1.019              | 2.64  | 4th  |
| 5.  | Sustainable materials and resources    | 0.885              | 2.24  | 5th  |
| 6.  | Energy conservation and renewable energy| 0.869             | 2.19  | 6th  |
| 7.  | Sustainable design                     | 0.969              | 2.09  | 7th  |
| 8.  | Nanotechnology                         | 0.797              | 1.96  | 8th  |
| 9.  | Smart grid                             | 0.939              | 1.88  | 9th  |

Based on these statistics, it could be deduced that construction professionals in the study area rarely or never take into consideration the various elements needed to achieve sustainable construction. Failure of the professionals to take into consideration certain intrinsic elements such as energy conservation, nanotechnology, smart grid, and water efficiency among others have plagued the achievement of sustainability in the built environment. The findings of Zaki [19] brought more clarity to this discussion where it was submitted that construction professionals in the developing countries were trained in institutions where sustainable development was not taught, thus impeding them to understand and integrate the various elements needed in construction projects. It could be submitted that Nigeria construction industries have neither deployed the right approach nor fostered the necessary elements needed to achieve sustainability. This was supported by Aghimien [9], where it was revealed that the state of the Nigerian construction industry including its methods and mode of operation does not support the successful achievement of sustainable development.

The empirical and theoretical findings of this research revealed that there is an inadequacy in the knowledge of sustainable development among professionals within the built environment field in Nigeria. Although these professionals are familiar with the concept of sustainability, little attention has been paid in terms of acquiring knowledge in the key areas of sustainable practices and their application within the built environment. The professionals are neither aware nor conscious of application of sustainable practice, green building design principles and ratings as they apply to construction projects. The study also reveals that professionals do not employ basic constituents needed to achieve sustainability in construction projects. Elements such as smart grid and nanotechnology, which are the future of construction and engineering are yet to be considered for implementation in the study area. Contributing to global sustainability is gradually becoming the order of the day, and this can be efficiently achieved through the encouragement of sustainable practices in the construction industry.

4. Conclusion

This study has examined the capacity of construction professionals in delivering sustainable construction in Nigeria. The study found that although construction professionals are familiar with the concept of sustainability, little attention has been paid in terms of acquiring knowledge in the key areas of sustainable practices within the built environment. The study further revealed that professionals are
not equipped to apply sustainable practices to construction projects. This study, therefore, recommends that the local construction industry must be completely overhauled in other to accommodate sustainable practices. This can be done through a number of means, the first being educating and sensitizing various construction professionals on the aim; benefits; principles; tools; techniques of adopting and implementing sustainable construction practices. Additionally, headway can be attained on this issue by stipulating, adopting and enforcing minimum sustainable standards for all construction projects within the industry. In conclusion, sustainable construction is fast becoming the basis of all construction projects globally and the Nigerian construction industry must take adequate steps to ensure that it is not left behind in the race to create an environmentally responsible world.

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