Sustaining the Sustainable Development in Nigeria’s Built Environment: Determinant Factors

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Abstract. Sustainable development is means to balance the needs of the present and future generations without compromise. However, achieving such a feat may be less challenging for developed countries, but it is a big challenge and more complicated for developing countries like Nigeria, located in West Africa. Nigeria’s population is about 200million and growing, which comes with its prospects, needs, and challenges such as the need for more infrastructure and industries to reduce poverty and create more employment opportunities. Other challenges include addressing housing shortages, disposal of domestic and industrial wastes, curbing industrial pollutions, providing cleaner and drinking water for domestic purposes, need for more power supply, increased food, material production, and consumptions etc. altogether, they must be within a balanced ecosystem and environmentally sustainable biodiversity within the built environment. This paper assessed and discussed the determinant factors related to sustaining sustainable development in Nigeria to offer more insight into such factors, paving ways of addressing such issues. A sequential mixed methodology was adopted in the study to collect and analyze the data on such factors. The results show that Stakeholders Awareness and Interests; Funding; Policy framework, Infrastructure project planning, and execution; corruption were among the most significant impact factors that sustained Nigeria’s built environment's sustainable developments. Depending on the project type, such factors can promote or hinder sustainable developments in the built environment based on their levels of impacts.

1. Introduction
Owing to the use and waste of energy to deal with population growth and its demands, the planet has been more concerned about the atmosphere and climate change in the last three decades. These
conditions necessitate introducing resource-efficient interventions in all areas of human life, including the built environment, which is critical. Overall, these have prompted calls for long-term solutions and efforts in every area of human endeavor [1]. As a continuation of the millennium development goals (MDGs), the United Nations (UN) General Assembly negotiated and approved the 2030 Sustainable Development Goals (SDGs) agenda in 2015. This Agenda is a set of goals for individuals, the environment, and everyone’s success. Within its context, it outlines 17 Sustainable Development Goals and 169 priorities [2].

The best way to maintain and align both current and future generations’ ability to fulfill their own needs is to use sustainable practices and methods[3]. Due to differences in practices, resource use, emissions, and other problems, each industry views sustainability through its lens. Because of the effect of human interaction on infrastructure before and after building, the constructed environment, to which the construction industry belongs, is not an exception. Infrastructural projects are small scales like residential buildings or mega projects such as (bridges, tunnels, airports, seaports, dams, roads and railway projects, etc.), have a significant impact on the environment. Ensuring sustainability within the built environment in all sustainable developments is a gigantic task that requires the “buy-in” from all the stakeholders or players involved. These may be easier or less complicated for some developed countries, but it is a big challenge and more complicated for developing countries like Nigeria.

Nigeria is a developing country and the largest economy in Africa, and it has changed dramatically in recent years. However, before it can genuinely realize its economic, social, and growth potential, it must address certain fundamental challenges [4], such as incorporating the population’s demography, social, political, and natural resource potentials into economic strategies and policies in order to achieve long-term growth and development. Population growth brings with it opportunities, needs, and challenges, especially for current and future infrastructural planning. Nigeria’s annual average public spending in infrastructure across the sectors of transportation (rail, highways, airports, and ports), energy, telecommunications, and water between 2007 - 2017 was less than 4% of GDP and did not exceed 5% of GDP in any given year during that time, according to the Global Infrastructure Outlook report cited by [5]. Investments in transport networks, excluding inland waterways, have a beneficial impact on gross domestic product per capita, even though they are involved in environmental contaminants and CO2 pollution [6], thus shaping the barriers to SD[7]. Balogun[8] opined that it is never late for infrastructure development and growth for a developing country like Nigeria. Today’s megaprojects’ physical and economic size is to the degree that countries may be influenced in both the short and long term by the progress or failure of only a single project from the economic, environmental, and political support those projects initially enjoyed[9]. Odundo[10] concluded that the Nigerian government had yet to recognize environmental management as a priority, affecting funding to ensure it.

Nigeria suffers from serious infrastructural deficits and is in urgent need of Large / Mega Infrastructural Development Projects (IDPs) to address the current population’s needs (social, economic, and technological needs). However, while such initiatives and other practices within the BE affect the climate, they must be maintained as part of a sustainable ecosystem and biodiversity that addresses Nigerians’ problems while still striving to achieve the 17 SDGs. As a result, this paper aims to analyze and examine the determinant factors relevant to maintaining sustainable development in Nigeria to provide more insight into these factors and pave the way for solutions to such problems. This study is limited to sustainable issues and their impacts on sustainable development projects such as mega construction projects (MCPs) as Infrastructural Development Projects (IDPs) within Nigeria’s BE.

2. Materials and Method

2.1 Built Environment and Sustainable Development Issues

Most infrastructure delivery practices within the BE, according to Edwards[11], rarely recognize the link between biodiversity and human health, as little attention is paid to the incorporation of specific biodiversity strategies for sustainable urban growth. Preservation and appreciation of both would go a long way toward reducing negative impacts while enhancing sustainability, liveability, and a well-
balanced environment of both the natural and BE worlds. According to Aronson et al. [12], maintaining and enhancing biodiversity through the design (for infrastructural projects, especially IDPs) and managing a sustainable urban environment necessitates taking into account ecological, human needs, and usage for such projects. When considering the protection and restoration of nature as an important part of IDPs and associated developments or regeneration programs, the BE (pre and post-IDP activities) offers a tool for ensuring biodiversity (focusing on sustainability). BE's pre-and-post-IDP activities provide ideal opportunities for greening the urban landscape, which can be accomplished if the project is well-integrated with sustainable features and approaches.

2.2 Built Environment and Sustainable Development Goals
The UN formulated the 17 outlined SDGs plan of action (169 targets) for people, planet, and prosperity for effective implementation within the BE and the natural habitat. However, achieving these SDGs hinges on each country’s implementation and policy frameworks to achieve the goals. Developing countries like Nigeria, whose infrastructural deficit is significant, require IDPs to attain such goals, especially the SDG numbers 1-4, 6-13, and 15-17. The adequate infrastructure bridges the socio and economic gaps and deficits [13] that will, in turn, ensure excellent liveability of all people in societies, sustainable consumption, provide jobs, drinking water, equality while alleviating hunger.

These clearly show the BE's effects on a more sustainable BE worldwide [14]. One main initiative for saving the world for present and future generations is the worldwide implementation of the 2030 Vision for SD, which includes 17 SDGs and 169 targets/priorities, all of which are supported by 232 indicators[2]. The SDG aims at “protecting, restoring and promoting sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and biodiversity loss” (UN, 2015). Any IDPs within the BE must be carried to ensure the most negligible negative impact on the environment, positive effects on the habitats’ good health and wellbeing, and balanced and better biodiversity. Table 1 below shows the cross-matrix relationship and interaction between the types of IDPs and the 17nr. SDGs

| Sustainable Development Goals | Infrastructural Development Projects in the BE |
|------------------------------|-----------------------------------------------|
| Goal 1                       | Roads & Rail Projects                          |
|                              | Dams, Hydro, Water projects                    |
|                              | Residential & Commercial Buildings             |
|                              | Manufacturing and Industrial Zones             |
|                              | Health, Education and ICT Facilities          |
| Goal 2                       | ✅                                             |
| Goal 3                       | ✅                                             |
| Goal 4                       | ✅                                             |
| Goal 5                       | ✅                                             |
| Goal 6                       | ✅                                             |
| Goal 7                       | ✅                                             |
| Goal 8                       | ✅                                             |
| Goal 9                       | ✅                                             |
| Goal 10                      | ✅                                             |
| Goal 11                      | ✅                                             |
| Goal 12                      | ✅                                             |
| Goal 13                      | ✅                                             |
| Goal 14                      | ✅                                             |
| Goal 15                      | ✅                                             |
| Goal 16                      | ✅                                             |
| Goal 17                      | ✅                                             |

Source: Author, 2021 (✅ = Directly Related; * = Somehow / not Related). Find SDG List in Appendix

2.3 Factors Shaping the Sustainable Development in Nigeria’s Built Environment.
Some factors may drive and or promote sustainable development (SD); others may be barriers and hinder such developments whereas, other factors may determine how the SD will occur. In some instances, the existing and future infrastructural development projects will show how the BE can be impacted
sustainably within the overall attempt to achieve a balanced ecosystem/biodiversity and environmental sustainability. Several studies [7], [10]–[12], [14]–[20] have highlighted some barriers, hindrances, and determinant factors that may likely impact sustainable development in developing countries like Nigeria. The prominent among these factors were: Assimilation of Sustainable technologies and processes; Availability of Trained Professionals; Corruption; Existing infrastructure; Funding; Infrastructure (IDPs) Planning and Execution; Locally Sourced Sustainable Materials; Policy framework; Socio-economic Targets and Pressures; Socio-Political stability; Stakeholders’ Awareness & Interests.

These 11nr of identified factors form the research questionnaire’s backbone and the subsequent analyses in this study. They were also central to the hypothesis formulated for the study, shown below.

- Ho: No significant factors are affecting the SD in Nigeria’s BE.

2.4 Research Methods

The study adopts mixed sequential methods (Qualitative and Quantitative methods). These led to the identification of the existing and planned IDPs, which were examined concerning the SDGs. Also, 11nr of factors serving as barriers, hindrances that also determine sustainable development in Nigeria were identified and structured in a questionnaire. The questionnaires were randomly distributed to various stakeholders to obtain valuable opinions on these outlined factors.

3. Data Analyses

A total of 700nr of questionnaires were distributed randomly to the various stakeholders comprising project clients, end-users, project professionals, sustainable development advocates, and academicians. The obtainable and analyzed responses amount to 391nr (55.9%) while 309nr (44.1%) questionnaires were non-responsive. From the responsive questionnaires, the private sector consists of 43% (168nr), the public sector 48.1% (188nr), and other semi-formal sectors with 9% (35nr). The overall assessment of responses based on the impact of the factors on sustainable development in Nigeria’s BE is shown in table 2 below based on Mean Item Score (MIS) and Relative Importance Indices (RII).

Table 2. Assessment of Sustainable Development Factors in Nigeria

| S/N | SD Factors in Nigeria's BE                                                                 | Mean Item Score | Remark based on Impact | RII | Ranking |
|-----|------------------------------------------------------------------------------------------|-----------------|------------------------|-----|---------|
| 1   | Assimilation of Sustainable technologies and processes                                   | 2.59            | Moderate               | 0.52| 10th    |
| 2   | Availability of Trained Professionals                                                    | 2.94            | Moderate               | 0.59| 9th     |
| 3   | Corruption                                                                              | 4.05            | Strong                 | 0.81| 4th     |
| 4   | Existing infrastructure                                                                   | 2.27            | Low                    | 0.45| 11th    |
| 5   | Funding                                                                                 | 4.17            | Strong                 | 0.83| 3rd     |
| 6   | Infrastructure (IDPs) Planning and Execution                                            | 3.82            | Strong                 | 0.76| 5th     |
| 7   | Locally Sourced Sustainable Materials                                                    | 3.14            | Moderate               | 0.63| 7th     |
| 8   | Policy framework                                                                        | 4.31            | Strong                 | 0.86| 2nd     |
| 9   | Socio-economic Targets and Pressures                                                      | 3.10            | Moderate               | 0.62| 8th     |
| 10  | Socio-Political stability                                                                 | 3.62            | Strong                 | 0.72| 6th     |
| 11  | Stakeholders’ Awareness & Interests                                                       | 4.51            | Extreme                | 0.90| 1st     |

Source: Author, 2021

The hypothesis testing for the statistical significance of the factors was computed using T-test statistics based on the MIS values in table 3 above, and the result is in table 3 below.

Table 3. Research Hypothesis Testing using T-test

| SD Factors | Mean | Standard Deviation | Standard Error | N  | DF | level of significance | P-value | T-cal | T-tab _0.05, 10_ | Significance |
|------------|------|--------------------|----------------|----|----|-----------------------|---------|-------|-----------------|-------------|

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| 11nr. SDF | 3.50 | 0.74 | 0.22 | 11 | 10 | 0.05 | 0.00 | 15.63 | 1.81 |
|-----------|------|------|------|----|----|------|------|-------|------|
| **Source:** Author, 2021 |

The research deductions were made from Table 2 and 3 above. One factor has an extreme impact; five factors have a strong impact, while four factors were deemed to have a moderate impact and only one factor deemed with a low impact on the SD in the BE in Nigeria. All the identified factors have a varied level of impact on the overall SD of the BE in Nigeria. The hypothesis testing also indicates that the null hypothesis was rejected because these selected factors are deemed very “significant factors affecting the Sustainable Development in Nigeria’s Built Environment.”

4. Implication and Summary of Research Findings

The stakeholders’ awareness and interests for SD have an extreme impact on sustaining the SD. This is because to affect any policy framework for SD, and there is a need for awareness, good intention, and interest to carry out such policy to fruition. Hence the strong impact of the policy framework on SD. There is a need for adequate funding for such or any infrastructural development projects planned for execution to sustain any BE development. The funding for such IDPs must be ethically spent on such projects without any form of corruption and or misappropriation, as they can both derail any type of SD project. Funding for the planned IDPs and corruption were all deemed to have a substantial impact on SD in the BE because they are intertwined and are a significant barrier and hindrance to any SD in Nigeria; the existing infrastructure is deemed to have a low impact on the SD due to its inadequacy and huge deficit considering the population growth and its needs in Nigeria.

Socio-political stability is another factor deemed to have a strong impact on Nigeria’s development, without which there will be SD. From 1999-onwards, Nigeria witnessed an uninterrupted democratic leadership that establishes order and stability while ensuring SD policies for IDPs to foster economic growth and development. This political stability provides a transparent consideration for socio-economic pressure (moderate impact) arising from unemployment, poverty, hunger, lack of adequate housing, education, health, energy/power, water, production, and sustainable consumption vital in achieving SDGs. Other factors that have a moderate impact on the SD were the Availability of Trained Professionals who can help in the rapid assimilation of Sustainable technologies and processes or provide strategies to locally Sourced Sustainable Materials for IDPs in Nigeria’s BE. Their impact may be moderate, but it has a synergistic effect on the overall capacity to ensure and sustain any form of SD in Nigeria.

5. Conclusions

This study assessed and discussed the Sustainable development in Nigeria’s BE considering what promotes, impinge, or hinders sustaining such developments based on the IDPs that are meant to cater to the needs of the present without compromising the ability of future/coming generations to meet their own development needs. Such a feat may be less complicated for some developed countries, but it is a challenge and more complicated for developing countries like Nigeria due to the eleven factors identified as having significant impacts on its SD. The stakeholders’ awareness and the alignment of their interests is the major factor to sustain the SD. These will pave the way to the practical and effective policy framework, funding, minimizing corruption, upgrading existing infrastructure while planning and executing new IDPs smoothly, which will invariably lessen the socio-economic pressures on the population and foster socio-economic growth, which is fundamental in achieving most of the goals in the outlined 17 SDGs. However, these can only be achieved with continuous socio-political stability, which is paramount to sustaining sustainable development within the BE in Nigeria.

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Appendix: List of the Sustainable Development Goals (SDGs)

| GOAL 1: No Poverty; | GOAL 2: Zero Hunger; | GOAL 3: Good Health and Well-being; | GOAL 4: Quality Education; | GOAL 5: Gender Equality; | GOAL 6: Clean Water and Sanitation; | GOAL 7: Affordable and Clean Energy; | GOAL 8: Decent Work and Economic Growth; | GOAL 9: Industry, Innovation and Infrastructure; | GOAL 10: Reduced Inequality; | GOAL 11: Sustainable Cities and Communities; | GOAL 12: Responsible Consumption and Production; | GOAL 13: Climate Action; | GOAL 14: Life Below Water; | GOAL 15: Life on Land; | GOAL 16: Peace and Justice Strong Institutions; | GOAL 17: Partnerships to achieve the Goal |