

Assessment of Environmental Sustainability Considerations for Building Projects Design, Execution and Control In Ibadan, Oyo State, Nigeria

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ABSTRACT

Assessment of environmental sustainability considerations for building projects designs, execution and control was studied in Ibadan, Oyo State, Nigeria. This was with a view to assisting in preventing future urban decay in the study area. The study covered six Local government areas in Ibadan. The research instrument used was questionnaire. It elicited information on the issues such as respondents' profession, environmental conservation and preservation factors, provision of welfare facilities and environmental factors considered for building projects design, execution and control in the study area. The data collected was analyzed using both descriptive and inferential statistics. The results among others revealed that adequate information was available about environmental issues (4.05), and the state government developed environmental safeguard policies (4.10) were effective while the implementation of the environmental safeguard policies by the state government (1.74) and addressing environmental issues as part of projects design, execution, monitoring and control (1.34) were less effective and not effective. Provision of welfare facilities was somehow adequate (2.56) and less adequate (1.97). The study recommends among others that the State government should implement the environmental safeguard policies. This will enhance the environmental sustainability in the study area.

Keywords : Environmental Sustainability, Assessment, Building Projects, Project Execution

I. INTRODUCTION

The activities that take place in towns and urban centres (cities) need to be integrated in urban planning and management. It is certain that urban centres will continue to expand, even if the costs of resources for building projects continually increase. Activities in towns and cities affect the environment locally, regionally and globally in both negative and positive ways [1]. Nowadays it has been widely recognized that humanity is facing various grand challenges such as climate change and resource depletion, the building and construction industry is responsible for the rise of these changes to a large extent.

According to [2], it is common in planning circles for urban planning to describe efforts to reverse problems of urban sprawl, congestion, and decline as a search for urban sustainability [2]. Today, developers have realized that many of the natural resources available to humankind are finite and should be used wisely. Also, conservationists have recognized that the objectives of conservation are somehow difficult to achieve due to poverty in developing countries in which Nigeria is one. A sustainable human settlement is a settlement that works for its residents, both now and in future, it is a settlement in which people live; in which they shop, seek entertainment, care for their children, and socialize [1].

Presently, Ibadan, the Oyo State capital has eleven local government areas. These are Ibadan South East; Ibadan South West; Ibadan North; Ibadan North East; Ibadan North West; Ido; Ona-Ara; Egbeda; Oluyole; Lagelu and Akinyele. The first five Local governments areas are highly urban density areas while the remaining are partially high and low urban density areas. With time the low urban density areas will become high urban density areas. The present government is embarking on re-development projects in the highly urban density areas. The negative impacts of high-density development on the built environment led to the re-development projects in the high-density areas.

The urban decay problems that affect the high-density areas should be a lesson for the developing of the low-density areas. This will prevent such problems to occur in future when low-density metamorphosed to high-density areas. Future urban decay should be avoided in the present low-density areas. This is why environmental sustainability considerations for building projects design, execution and control in Ibadan, especially low-density areas are critical.

1. Statement of the Problem

Land is one of the factors required when a building project is to be designed and executed. The basic objective of physical planning is to adequately and efficiently plan the human environment to prevent haphazard development and its consequences towards controlling the use and development of lands, natural resources and man-made features therein [3]. As all know in Ibadan and her environs, land is expensive especially areas close to high-density. People prefer to move to a little far from high-density area forgetting that low-density today becomes high-density tomorrow. Low-density areas where poor people prefer to settle should be planned for future sustainability.

Due to the uncontrollable of population in Nigeria, cities are engaged with environmental issues. Future urban decay, such as traffic congestion, pollution

problems, heat effect and distortion of micro-climate among others should be considered in planning practice for environmental sustainability.

Presently in the low-density areas, clients need to be guided especially on the issue of environmental sustainability. Most clients just engaged quack team project members to handle their building projects instead of professionals. A draughtsman performs the functions of an architect. Clients/bricklayers execute projects without due process. Development and Construction activities can make an important contribution to the conservation of biodiversity by integrating the environment in urban planning and management in the execution of building projects. Therefore, this study assessed the environmental sustainability considerations for building projects, design, execution and control in Ibadan, Oyo State.

2. Objectives of the Study

The aim of the study was to assess the environmental sustainability considerations for building projects design, execution and control in the low-density areas of Ibadan with a view to assisting in preventing future urban decay in the area. In achieving this aim, the specific objectives were to assess the:

- i. Effectiveness of the environmental conservation and preservation factors of the study area,
- ii. Adequacy of the provision of welfare facilities; and
- iii. Environmental factors considered for building projects design, execution and control in the study area.

II. METHODS AND MATERIALS

The research framework for this study is based on a literature review on environmental sustainability in planning practice, questionnaire survey, descriptive and inferential analysis. The study was carried out in Ibadan, Oyo State, Nigeria. Ibadan, a metropolitan city has eleven local government areas.

The scope of this study is limited to low density areas of Ibadan. Low density today will become high-density in future. Therefore, the environmental sustainability for building project design, execution and control in Ibadan, Oyo State is critical.

Also, the theory built upon the study of environmental sustainability, which suggests a planning process that allows human society to live within the limitations of the biophysical environment' [4]. Industry practitioners having prominent roles in urban development and redevelopment, including planners, architects and builders in Ibadan were the target respondents for the survey. The professional Institutes such Nigerian Institute of Town Planners (NITP), Nigeria Institute of Architects (NIA) and Nigeria Institute of Building (NIOB) Oyo State Chapters assist the researcher in getting the respondents. One hundred and ninety-seven copies of questionnaires were distributed to members, randomly selected from each institute during the institutes' monthly meetings. The respondents include Planners(58), Architects (64) and Builders (75), to ensure a comprehensive view of the environmental sustainability consideration in Ibadan. The respondents were given self-administered questionnaire and they were asked to rate the effectiveness of the environmental factors as they affect sustainability considerations, adequacy of welfare facilities provision and the extent to which environmental factors were considered for building projects design, execution and control.

Average index analysis was to analyse the data obtained from the respondents. However, the mean value was obtained from A1 by simplifying the arithmetic average of the values in the set, which was acquired by summing the values and dividing by the number of values.

Average index (AI) was employed to measure the average value of the data gathered from the questionnaire. In addition, it was also used to measure and testify a set of observation data into a single value.

The range of the value was tabulated in Table 1. A1 is applied in this research to determine the importance of each variable from the opinion of respondents. The calculation for A1 is based on the equation as stated below:

$$\text{Average} = \frac{\sum a_i x_i}{\sum x_i}$$

Where:

a_i= constant expressing the weight given to i

x_i= number of response for i= 1,2,3,4,5.

X₁= number of respondents who answered not effective, not adequate and very low.

X₂= number of respondents who answered less effective, less adequate and low.

X₃= number of respondents who answered somehow effective, somehow adequate, and moderate.

X₄= number of respondents who answered effective, adequate and high.

X₅= number of respondents who answered very effective, very adequate and very high.

The method of averaging individual rating to a discrete value or index is easy, but extra care is required during its analysis and interpretation of these values so that they reflect the overall respondents' ratings.

TABLE I. CLASS RANGE OF AVERAGE INDEX

Mean Range	Likert Scale
1 ≤ Average index < 1.49	Not effective, Not adequate Very low.
1.50 ≤ Average index < 2.49	Less effective, Less adequate Low.
2.50 ≤ Average index < 3.49	Somehow effective, Somehow adequate, Moderate
3.50 ≤ Average index < 4.49	Effective, Adequate High

4.50 ≤ Average index < 5.0	Very effective Very adequate Very high.
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Source: [5]

Data collected from the questionnaire survey was converted into code before being entered into a database created in Statistical Package for Social Sciences (SPSS) for Windows version 23, which was employed for descriptive and inferential analyses. Since this study aims to assess the environmental sustainability consideration for building projects design, execution and control in Ibadan, only relevant results are reviewed here.

III. RESULTS AND DISCUSSION

1. Number of Copies of Questionnaire Administered and Retrieved

Total number of 197 copies of questionnaire were administered to the respondents, while 151 copies were retrieved, representing 76.6% of the respondents. Table 2 shows the breakdown of the distributed and retrieved copies of the questionnaire. Total number of 151 copies was used for the analysis of the study.

TABLE II. QUESTIONNAIRE ADMINISTERED AND RETRIEVED

Professionals	Questionnaire administered	Questionnaire retrieved	Percentage
Planners	58	43	74.1
Architects	64	49	76.6
Builders	75	59	78.7
Total	197	151	76.6

Source: Field Survey 2017

Table 3 shows the respondents profession. The data from the Table shows that builders have the highest percentage with 39.1%, architect 32.5% and planners 28.5%. These professionals take active roles in environmental sustainability.

TABLE III. RESPONDENTS PROFESSION

Professional	Frequency	Percentage
Planner	43	28.5
Architect	49	32.5
Builder	59	39.1
Total	151	100

Source: Field Survey 2017

Table 4 shows the number of years of relevant work experience of the respondents. The data from the table shows that 41.7% of the respondents have between 11 and 15 years of relevant work experience, while 41.1% have above 16 years work experience. This shows that majority (82.8%) of the respondents have above 11 years of relevant work experience, which means that they are familiar with environmental issues both within and outside the study area. Therefore, there was no challenge in filling the questionnaire given to them.

TABLE IV. RESPONDENTS PROFESSION

Years	Frequency	Percentage
0-5	10	6.6
6-10	16	10.6
11-15	63	41.7
Above 16	62	41.1
Total	151	100.0

Source: Field Survey 2017

Table 5 shows the perceived environmental conservation and preservation factors as rated by the planners, architects and builders. The decision of the table was based on a rating scale of 1 ≤ Average index < 1.49 not effective to 4.50 ≤ Average index < 5.0 very effective.

The results show that adequate information is available about environmental issues and the state government developed environmental safeguard policies were effective in terms of how the factors affect conservation and preservation of the environment. However, commitment to introduce

measures and change in order to genuinely mainstream environment in its policies, guidelines, plans, actions, operations and so on was somehow effective as rated by the planners and architects and less effective as rated by the builders. In additions, environmental concerns communicated within the city are somehow effective in terms of how the factors

affect the environment. Similarly, community involvement in environmental decision making, the state government implemented environmental safeguard policies and addressing environmental issues as part of project execution, monitoring and control were less effective in terms of how the factors affect conservation and preservation of the environment.

TABLE V
ENVIRONMENTAL CONSERVATION AND PRESERVATION FACTORS

Environmental Factors	Planner		Architect		Builder	
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
Adequate information is available about environmental issues	4.33	.474	3.96	.286	3.92	.677
The state government developed environmental safeguard policies	4.33	.474	3.96	.351	3.83	.530
Commitment to introduce measures and change in order to genuinely mainstream environment in its policies, guidelines, plans actions, operations. Etc.	3.14	.560	2.86	.354	2.15	.407
Environmental concerns communicated within the city	3.02	.152	2.96	.406	2.85	.448
Community involvement in environmental decision making	1.88	.324	1.98	.143	1.84	.365
The state government implemented environmental safeguard policies.	1.79	.412	1.96	.429	1.54	.502
Addressing environmental issues as part of project execution, monitoring and control	1.09	.294	1.27	.569	1.58	.498

Key: 1-Not effective 2-Less effective 3-Somewhat effective; 4-Effective 5=Very effective

Table 6 shows the combined perception of environmental conservation and preservation factors by the three categories of respondents (Planners, Architects and Builders). The results in Tables 5 and 6 are similar. The data from Table 6 shows that adequate information is available about environmental issues (4.05), and the state government developed environmental safeguard policies (4.01) were effective as rated by the respondents and ranked 1 and 2 respectively. However, environmental concerns

communicated to introduce measures and change in order to genuinely mainstream environment in its policies, guidelines, plans, actions, operations, and so on (2.66) were somehow effective. Furthermore, community involvement in environmental decision making (1.90), the state government implemented environmental safeguard policies (1.74), and addressing environmental issues as part of project execution, monitoring and control (1.34) were less effective as rated by the respondents. The results agree

with the issues on physical development control in Oyo State as emphasized by [6], that lack of government support, inefficient and unstable planning administration, non-compliance with planning laws and poor planning practice among others hindered effective physical planning practice in Oyo state.

Nevertheless, effective environmental governance requires sound and effective urban governance. [7, 8], emphasized that environmental sustainability is to increase the knowledge of the planning and decision-making process.

TABLE VI. COMBINED PERCEPTION OF ENVIRONMENTAL CONSERVATION AND PRESERVATION

Environmental Factors	Mean	Std. Deviation	Rank
Adequate information is available about environmental issues	4.05	.546	1
The state government developed environmental safeguard policies	4.01	.503	2
Commitment to introduce measures and change in order to genuinely mainstream environment in its policies, guidelines, plans actions, operations. Etc.	2.93	.377	3
Environmental concerns communicated within the city	2.66	.610	4
Community involvement in environmental decision making	1.90	.301	5
The state government implemented environmental safeguard policies.	1.74	.483	6
Addressing environmental issues as part of project execution, monitoring and control	1.34	.515	7

Key: 1-Not effective 2-Less effective 3-Somewhat effective 4-Effective 5=Very effective

Table 7 shows the provision of welfare facilities in the study area. These perceived provision of welfare facilities were rated on a rating scale of 1 not adequate to 5 very adequate, none of the provision of the

facilities was rated very adequate. In addition, the provision was rated somewhat adequate by the planners while both the architects and builders rated the provision of the facilities less adequate.

TABLE VII. PROVISION OF WELFARE FACILITIES

Welfare facilities	Planner		Architect		Builder	
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
Provision of waste emission	2.58	.499	2.31	.466	1.98	.347
Provision of public facilities, e.g. schools, healthcare services, recreation centres etc.	2.56	.502	2.33	.474	2.08	.468
Provision of open space, e.g parks, seating areas and promenade	2.56	.502	2.31	.466	2.03	.454
Provision to control pollution, e.g. air and noise	3.02	.152	2.96	.406	2.85	.448

Key: 1-Not effective 2-Less effective 3-Somewhat effective 4-Effective 5=Very effective

Table 8 shows the perceived level of environmental factors considered for building projects designed, execution and control. As revealed by the table, the Analysis of Varaince (ANOVA) shows that there was a significant difference ($P \leq 0.05$) in the perceived environmental factors considered for building projects design, execution and control in the study area. Adherence to planning regulations and standards by the public (0.000), accessibility (0.000), green features (design related) e.g; optimization of natural lightning and ventilation, provision of sun shades, balcony and so on (0.000), addressing environmental issues as part of project execution, monitoring and control (0.003) and green features (construction related) e.g; installation of energy efficient/water saving devices, use of durable construction materials, etc. (0.003) were significantly different. However, layout of building and streets (0.510) and embarking on physical development activities (building projects) without obtaining development permit/approval from relevant physical planning agency (0.224) were not significantly different.

This result was in line with the opinion of [9] that development and construction activities can make an important contribution to the conservation of biodiversity by applying environmental management in the execution of projects.

Also, [10], emphasized that building and streets should be of appropriate form, mix and position in order to ensure that the uses are compatible with the surrounding areas, disruption to the urban spaces and natural landscapes is minimized, negative impact on local climate are avoided. This can be achieved by obtaining development permit/approval from relevant physical planning agency.

TABLE VIII. PERCEIVED LEVEL OF ENVIRONMENTAL FACTORS CONSIDERED FOR BUILDING PROJECTS DESIGN, EXECUTION AND CONTROL

Environmental factors	F	Sig	Decision
Adherence to planning regulations and standards by the public	67.106	0.000	Significant
Efficient use of land space	9.006	0.000	Significant
Accessibility	10.102	0.000	Significant
Layout of building and streets	0.676	0.510	Not significant
Addressing environmental issues as part of project execution, monitoring and control	6.054	0.003	Significant
Green features (design related) e.g; optimization of natural lightning and ventilation, provision of sun shades, balcony and so on, etc.	23.671	0.000	Significant
Green features (construction related) e.g; installation of energy efficient/water saving devices, use of durable construction materials, etc.	5.960	0.003	Significant
Embarking on physical development activities (building project) without obtaining development permit/approval from relevant physical planning agency	1.513	0.224	Not significant

IV. CONCLUSION

The study has been able to assess the environmental sustainability considerations for building projects design, execution and control in Ibadan, Oyo State, Nigeria; with a view to assisting in preventing future urban decay in the study area. The study concluded that despite the fact that Oyo State government developed environmental safeguard policies; the implementation of the policies was less effective. This contributes to the failure of addressing to the failures of addressing environmental issues as part of project execution, monitoring and control in the study area. From the above conclusion, the following recommendations were made;

- (i) The state government should implement the environmental safeguard policies.
- (ii) All the professionals concerned in the physical planning and development and project design and construction should address environmental issues as part of project design, execution, monitoring and control.

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