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ENVIRONMENT IMPACTS OF BUILDING CONSTRUCTION PROJECTS EXECUTION IN IBADAN METROPOLIS, OYO STATE, NIGERIA

OYEWALE, JULIUS OJO; SUNDAY, OLUWASEYI GABRIEL; & SUARA, ABAYOMI USMAN

Department of Project Management Technology, Federal University of Technology, Akure

Corresponding Author: mailgabbie@gmail.com

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Abstract

Rapid industrialization and population explosion has led to increasing need for building construction projects to either provide shelter or for business ventures in urbanizing areas. A survey research design which made use of questionnaire to elicit relevant information from the respondents comprise the people (residents and shop owners) domiciled where building construction projects are executed located in three (3) urbanising LGAs in Ibadan metropolis namely, Egbeda, Lagelu and Akinyele. A sample size of 384 was arrived at using surveymonkey sample size calculation for unknown population. The study revealed harmful effect of building constructions projects as "ecological impact" with grand Relative Impact Index (RII) value of 0.96(1st) posed to have most harmful effect from activities of construction firms in the study area. This is followed by that "pollution impact" having a grand RII of 0.94(2^{nd}) and then "energy impact" with grand RII value of 0.92(3^{rd}). The third objective on evaluation of steps taken by construction firms in abating the harmful effects of their construction activities in the study area reveals

Keywords: EIA, project execution, mitigation, built environment, urbanizing

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that the respondent are highly dissatisfied with mitigation measures put in place by the construction firms with mean item scores ranging from 1.27 to 2.48. The study's hypothesis was retained, thus upholds that Environmental Impact Assessment (EIA) mitigations measure put in place by constructions firms do not have significant effect implementation of building construction projects as P-value of 0.396 at 95% significant level. The stud established that building construction projects have over time had major environmental impact in the study area causing significant destruction to the ecosystem, natural resources depletion and compromised public health hygiene. The study therefore recommends that huge fine and sanctions should be imposed on EIA report defaulters and ministry of environment should devise mechanism to ensure strict site monitoring to ensure enforcement of EIA report.

Introduction

Aside the fact that building provide shelter for teeming population for developing countries, building construction industry has also been recognized as one for the drivers of national growth and development, however, building construction activities result into various environmental impacts (Amit &Ipshita, 2014; Aremu, Aremu & Olukanni, 2015;Vivek, Anjali, Akash & Manjul 2016). In order to reduce or control the environmental pollution which results from the construction activities, Environmental Impact Assessment (EIA) was introduced in USA in 1969 with its enactment into the National Environmental Policy Act (NEPA) on January 1, 1970. This act compels all agencies in the US to include EIA in every recommendation or report on proposals for legislation and other actions significantly affecting the human well-being in the environment. As time pass on, institutionalization of EIA cut across Canada, Western Europe, few countries in Asia and Latin America, and as well in African countries (Glasson, Therivel & Chadwick, 1999). Considering the significance of EIA to sustainable development, the Federal government of Nigeria on December 10, 1993

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declared the EIA degree Decree No 86 of 1992 which enforced the process of EIA compulsory for all developmental projects. EIA serves to identify and evaluate the potential environmental, social, and health impacts of a proposed project to be carried out. It is the primary instrument for development planning and decision-making (Mora-Barrantes, Sibaja-Brenes, Piedra-Marin & Molina-Leon, 2018). It also involves assessing alternatives and designing appropriate environmental and social management plans throughout the projects lifecycle. Environmental impact of a proposed construction project or development activity and propose measures and strategies to mitigate the adverse impacts (Mane & Gahalod, 2023).

The design, construction, usage and maintenance of building structures have direct and indirect impacts on the environment ranging from energy impact, ecological impact, visual impact and material impact (Selvakumar & Jaykumar, 2016). Several environmental impact concerns arising from construction projects include noise and dust generation, natural resource depletion, high energy requirement, among others. These impacts need to be assessed prior to the building construction executions. Unplanned and unsustainable urban development creates insurmountable environmental challenges in emerging cities in developing countries (Mane & Gahalod, 2023). Population explosion in Nigeria has led to the migration of people from villages to cities, especially to fast urbanizing and commercial city like Ibadan, Oyo state capital. This movement increases the need for human settlements and likewise for industrial purpose whereby generates several issues to the environment. Natural vegetation, ground water resources are forced to give way to increasing construction projects. In recent time, modern building built in Ibadan metropolis mostly for commercial purpose have high level of energy consumption because of requirement of air-conditioning and lighting (Akintayo et al., 2020)

Although environmentally harmful activities differ from one industry to another, but it is well known that the built environment is biggest threat to

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the environment (UNEPBCC, 2009; Deng, Deng & Mahadev, 2014; Ijigah, Jimoh, Aruleba & Ade, 2016). The aggregate environmental impacts generated by building during its whole life-cycle is most likely of same magnitude as those generated during the construction stage (Deng et al., 2014). Therefore, the identification of likely impact on the environment in order of severity is highly imperative to minimizing the effect of construction projects on the environment (Akintayo, Oyebade, Songca, Adebisi, Oluwafemi & Fadipe, 2020). Hence this study assessed environmental impact of execution of building construction project on the environments and the corresponding mitigation measures put in place by construction firms in Ibadan metropolis.

Methodology

This study adopts a survey research design approach using structured questionnaire to gather data from respondents comprising residents and business owners around building construction sites in three (3) fast urbanizing LGAs namely, Lagelu, Egbeda and Akinyele in Ibadan metropolis, Oyo with an estimated population of 4,004,320. Using surveymonkey sample size table 1 for unknown population, 384 was considered a significant sample size for the study of 384

Table 1: Surveymonkey sample size for unknown population.

Population	Margin of Error/Degree of Freedom		Confidence Interval			
	10%	5%	1%	90%	95%	99%
100	50	80	99	74	80	88
500	81	218	476	176	218	286
1,000	88	278	906	215	278	400
10,000	96	370	4900	264	370	623
100,000	96	383	8763	270	383	660
1,000,000+	97	**384**	9513	271	**384**	664

Source:

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The 5-point likert scale was used for each section of the questionnaire as appropriate. 400 copies of questionnaire were distributed among the respondents. The statistical analysis was carried out by using Statistical Package for Social Sciences (SPSS) version 25. The study's objectives were analysed using frequency, standard deviation and mean item score (MIS) and Relative Impact Index (RII). The study hypothesis was achieved from significance P-value of Analysis of Variance (ANOVA) analysis. The decision rules states that at 95% significance level, a P-Value below 0.05 is regarded to be statistically significant, however, a P-value exceeding 0.05 is considered not statistically significant.

Results and Discussion

Response Rate

A total of 400 copies of questionnaire were distributed among the respondents in the study area. Out of a total of 400 copies of questionnaire distributed, 295 copies were retrieved from the respondents. Upon data coding and sorting which involves assessing the collected questionnaire for missing values and respondents' engagement in filling the questionnaire through frequency count, it was observed that 249 copies of the retrieved copies of questionnaire were completely and duly answered by the respondents representing 62.2.% of the distributed questionnaire were eventually used for data analysis. According to Moser and Kalton (1971), the result of a survey could be adjudged significant if the response rate is not lower than 30-40%. Hence, 71.1% response rate is considered significant for data analysis.

Environmental Impact of Building Construction Projects

This aim of this objective is to assess the activities of construction firms on the environment during building projects in the study area. Perception of the respondent were based on 5-point likert scale 1- very low; 2- low; 3- moderate;

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4- high; 5- very high. Descriptive statistics such as frequency, standard deviation, mean and relative impact index (RII) was used to achieve this objective. Frequency count in table 2 shows that quiet a large of the responses accounted for high and very high responses. This signifies similar pattern/opinion of the respondents on the items under consideration. From the mean score of respective items, the relative impact index (RII) was calculated and ranked accordingly using RII scale $0.8 \leq RI \leq 1$ = major impact, $0.6 \leq RI \leq 0.8$ = impactful, $0.4 \leq RI \leq 0.6$ = moderate impact, $0.2 \leq RI \leq 0.4$ = negligible impact, $0.0 \leq RI \leq 0.2$ = no impact.

Figures in table 2 under column RII shows that "ecological impact" with grand RII value of 0.96(1^{st}) posed to have most harmful effect from activities of construction firms in the study area. The respondents ascribed this major to destruction of farmland, opening of covering vegetation which eventually leads to erosion, hence affecting topography of the area. The study also discovered that "pollution impact" having a grand RII of 0.94(2^{nd}) also bear significant impact from building construction project in the study area. This is sequel to the air, land, noise and water pollutions ranging from dust, disturbing sounds and emissions from exhaust pipe of ever moving site trucks, discharge of effluents to streams and build-up of toxic in the soil. In the same vein, "energy impact" with grand RII value of 0.92(3^{rd}) shows that building project activities of construction firms in the study also bit hard on fossil fuel consumption used in operating sites machineries, trucks utility vehicles. They respondents opined that high demand of fuel by construction firms in the area caused raise in price of fuel which most times becomes unbearable to the residents. More so, high power consumption by site equipment result to voltage fluctuation in the study. The manner of resource depletion is also another source of concern in the area. It was reported by excessive use of natural resources like timber, raffia, aggregate, laterite, etc. by construction firms has deprived residents the beneficial use of these resources for their personal use. In a nut shell, building construction projects

have over time had major environmental impact in the study area causing significant destruction to the ecosystem, natural resources depletion and compromised public health hygiene. This is in consonance with Ejigah et al., (2013) that pollution, energy (power) consumption and use of resource, all above the mid-severity index of 0.5 have significant impact arising from building construction projects.

Table 2: Environmental Impact of Execution of Building Construction Projects

Environmental Impacts of Execution of Building Construction Projects	Perception of Respondents					Statistical Value			
	5	**4**	**3**	**2**	**1**	**St.Dev**	**Mean**	**RII**	**Remark**
Ecological Impact								**0.96**	
Destruction of farmland	209	40	0	0	0	0.367	4.83	0.96	Major impact
Loss of Wildlife/deforestation	179	70	0	0	0	0.450	4.71	0.94	Major impact
Erosion/Topographic	25	224	0	0	0	0.301	4.89	0.98	Major impact
Pollution Impact								**0.94**	
Dust and emission from combustion of fossil fuel	179	70	0	0	0	0.450	4.71	0.94	Major impact
Discharge of effluents to streams or farmland	174	70	5	0	0	0.509	4.67	0.93	Major impact
Noise pollution from blasting and machineries	209	40	0	0	0	0.367	4.83	0.96	Major impact
Risk of long-term build-up of pollutants	183	61	5	0	0	0.494	4.71	0.94	Major impact
Energy Impact								**0.92**	
Fossil fuel consumption	139	110	0	0	0	0.497	4.55	0.91	Major impact
Electricity consumption	168	81	0	0	0	0.469	4.67	0.93	Major impact
Raise in temperature	179	70	0	0	0	0.450	4.71	0.94	Major impact
Resource Usage	174	75	0	0	0	0.459	4.69	0.93	Major

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									impact

Source: Researcher's survey, 2025

RII Scale: 0.8 ≤ RII ≤ 1 = Major impact; 0.6 ≤ RII ≤ 0.8 = impactful; 0.4 ≤ RII ≤ 0.6 = moderate impact

0.2 ≤ RII ≤ 0.4 = negligible impact; 0.0 ≤ RII ≤ 0.2 = no impact

Mitigation Measures on Environmental Impact of Construction Projects

This objective is to evaluate steps taken by construction firms in abating the harmful effects of their construction activities in the study area. Respondents' view on certain mitigation measures were sought based on 5-point likert scale; not at all satisfied(1); slightly satisfied(2); moderately satisfied(3); satisfied(4) and completely satisfied (5). Descriptive statistics, minimum and maximum values, standard deviation and mean were used to achieve this objective. The minimum value (1) and maximum value (3) in table 3 shows that the respondents' choice of opinion ranges between not at all satisfied (1) and completely satisfied (3). Mean Item Score (MIS) for each of the items was used to report the perception of the respondents based on the mean value ranking 1.0-1.79 = not at all satisfied; 1.80-2.59 = slightly satisfied; 2.60-3.39 = moderately satisfied; 3.40-4.19 =Satisfied; 4.20-5.00= completely satisfied.

Going by the column MIS in table 3, a mean score of 2.48 (slightly satisfied) attributed to "identification of EIA authorized person" shows that the respondents' low contempt with regards to prompt attention on their complaints on environmental threats or resolutions safety concerns. This owes to either incompetence on the part of the personnel or non-challant attitude of the firm to the residents' yearnings. The study likewise revealed that "compliance with emission standards" with mean score of 1.72 (not at satisfied) is prevalent among construction firms in the study area. Release of nitrogen oxides from exhaust of vehicles and site machineries is a major health concern given low attention by construction firm in the study area. Similarly, resource control with mean score of 1.71(not at all satisfied)

portends that some common natural resource like timber, raffia palm, ornamental and medicinal trees are rapidly getting exhausted or destroyed as a result of indiscriminate clearing for construction purposes.

Furthermore, "waste material disposal" having mean score of 1.47(not all satisfied) infers the extent of land pollution caused by indiscriminate disposal of construction inert wastes which constitute environmental nuisance in the locality and threat to public health and hygiene. Similarly, a mean score of 1.30 (not all satisfied) apiece for "land degradation control" and "noise pollution control" further reiterate the height of pollution by the activities of construction firms in the study area. The residents decry the extensive lifting of laterite has resulted into land distortion and bad topography of the area. Also, damage and extinction done to both important flora and fauna species is likewise worrisome to the residents. More so, noise disturbance from heavy construction equipment and moving trucks to site have made live unbearable to the residence. "Control of ground and surface water pollution" with mean score of 1.27 (not all satisfied) is an indication of total negligence by construction firms in the study in curbing release of waterborne toxics and other chemical compounds from both waste materials and spilled fuel of machineries into nearby stream. Lastly, "resource control" with mean score of 1.27 (not all satisfied) revealed the level of deterioration to both resources like timber, raffia, sand, etc. due to extensive use from incessant construction activities in the study area.

Despite Adetunji et al., (2020) assertion that reducing material wastage in construction, increasing structure service life, minimizing dust generating activities, identification of authorized person responsible for air quality, elimination of site run-off water and increasing waste recycling of building materials were methods of controlling environmental impacts from construction projects, the research has found out construction firms in this study area have over the years paid lip service to abating the inconveniences caused by their construction activities.

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Table 3: Mitigation Measures on Environmental Impact of Construction Projects

Mitigation measures	Min	Max	Std. Dev.	Mean	Remark
Land degradation control	1.00	2.00	.461	1.30	highly dissatisfied
Control of health and safety measures	1.00	2.00	.452	1.28	highly dissatisfied
Control of air pollution	1.00	2.00	.446	1.27	highly dissatisfied
Control of noise pollution	1.00	2.00	.459	1.30	highly dissatisfied
Control of ground and surface water pollution	1.00	2.00	.447	1.27	highly dissatisfied
Resource control	1.00	5.00	.727	1.71	highly dissatisfied
Compliance with emission standards	1.00	5.00	.781	1.72	highly dissatisfied
Identification of EIA authorized person on site	1.00	5.00	1.323	2.48	dissatisfied
Waste material disposal	1.00	5.00	.798	1.47	highly dissatisfied

Source: Researcher's survey, 2025

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Mean Ranking: 1.00-1.80 = highly dissatisfied; 1.81-2.60= dissatisfied; 2.61-3.40=moderately satisfied; 3.41-4.20= satisfied; 4.21-5.00= highly satisfied

Test of hypothesis

H_0: Environmental Impact Assessment (EIA) mitigation measures do not significant impact in reducing effect of building construction projects in the study area.

Table 4. displays the outcomes of multiple linear regression testing the null hypothesis. R-square value of 0.003 under *model summary* indicates that EIA mitigation contributes just 3% to abating harmful effects of building construction project on the environment. Furthermore, under ANOVA table, , an insignificant value of 0.396 at 95 % significance level shows that inventory digitalization practices is significant to the model. Therefore, the null hypothesis mentioned earlier is retained. Hence, the study asserts that mitigation measures put in place by construction firms are not effective in abating the harmful effects of building construction projects on the environment in the study area.

Table 4: Analysis of Variance (ANOVA)

Model Summary[b]				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.054[a]	.003	-.001	.22887

a. Predictors: (Constant), EIA MITIGATION MEASURES

b. Dependent Variable: HARMFUL EFFECT OF BUILDING CONSTRUCTION ON ENVIRONMENT

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.038	1	.038	.723	.396[b]
	Residual	12.938	247	.052		
	Total	12.976	248			

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a. Dependent Variable: HARMFUL EFFECT OF BUILDING CONSTRUCTION ON ENVIRONMENT

b. Predictors: (Constant), EIA MITIGATION MEASURES

Conclusion

The study has established that building construction projects have over time had major environmental impact in the study area causing significant destruction to the ecosystem, natural resources depletion and compromised public health hygiene. This is as a result of non-compliance of EIA report guiding the modus operands of building construction projects and environmental protection and conservation. Furthermore, it is sadden to note that little or nothing has been by construction firms in the study area in abating harmful effects caused by incessant construction activities.

Recommendations

Sequel to the outcomes of this study, the following suggestions were put forward:

i. The ministry of environment in conjunction with building regulatory agency should devise mechanism to ensure strict site monitoring to ensure compliance of EIA report
ii. As a way of enforcing compliance, huge fine and sanctions should be imposed on EIA report defaulters.
iii. Construction firms should be compelled to pay for damages done to the environment and its inhabitants
iv. Appropriate communication channel between construction firm and the residents should be established to attend to the complaints of the people for prompt resolution.

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