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Sustainable Built-Environment: Appraisal of the Effects of Environmental Degradation and Construction Hazards in Nigeria

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ABSTRACT

Environmental challenges including degradation and construction hazards have been on the increase in Nigeria particularly in Niger Delta States resulting from continuous oil exploration and construction activities in the quest for economic growth and development. Thus, increased urbanization and industrialization has led to environmental degradation with its attendant effects on both humans and ecology of the Nigerian environment which is unsustainable. This paper critically examined the effects of environmental degradation and construction hazards on the built environment in Nigeria. Methodology of study include the use of structured questionnaires distributed to stakeholders in the environment namely environmental scientists, Surveyors, Engineers, Architects, project managers and farmers selected from Niger Delta States of Bayelsa, Delta and Rivers using purposive random technique. The 145 completed questionnaires were analysed using the Relative Importance Index (R.I.I.). Findings showed that several effects of environmental degradation and construction hazards abound, but categorized into 14 namely; health & safety impairment; local issues (noise, odour, vibration); accident & fire outbreaks; loss of genetic resources; landscape alteration; climate change/emissions; poverty on communities; loss of farming/fishing jobs; bio-diversity loss; distortion of ecosystem; flooding/erosion; pollution (air, land, water); dust & waste generation and traffic & visual issues. The study recommended sustainable construction techniques, enforcement of environmental protection policies for sustainable built environment in Nigeria.

Keywords: Degradation, Environment, Hazards, Pollution, Sustainable Construction.

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I. INTRODUCTION

Humans are always in constant interactions with the environment for the satisfaction of basic needs and existence. Thus, the daily human activities for economic growth and development geared towards industrial revolution and infrastructure development poses a major threat to the sustainability of the built environment through continuous resources utilization and consumption and deterioration of the environment.

Environmental degradation refers to any crisis that occurs in an environment beyond the individual, community or societal control yet affects the living conditions humans, flora and fauna' negatively. It is described as a form of unexpected occurrence and damage on the environment triggered by natural or manmade factors that is destructive or possibly detrimental to man and other components of the environment (Wright & Boorse, 2011; Enger & Smith, 2010). Environmental pollution which is a form of environmental degradation refers to the contamination of the environment by the release of harmful substances either through human activities or natural process and it is classified according to the receiving agents of air as emission, water as effluent and land as dumps and disposal respectively (Ukpong, 1994). On the other hand, hazards are unexpected occurrences or accidents resulting from natural or man-made factors that are potentially harmful to human lives at and the environment in general (Jay & Scott, 2011).

However, it should be stated that both environmental degradation and construction hazards are environmental challenges that results in the inhibition of the sustainability of the environment causing harm to man and the environment itself instead of being beneficial. Humans have always interacted with the environment from time immemorial and these interactions are as a result of mans' desire to satisfy basic necessity of life to improve standard of living. Accordingly, humans depends on the environment for survival and general wellbeing thus, increase in human population, advancement in technology, provision of infrastructure among other factors culminate in the destruction of the environment (Hyde & Reeve, 2011).

Environmental degradation and construction hazards are not without their negative consequences, as their effects are very serious and unpleasant. Thus, according to Jay & Scott (2011), the effects of

environmental degradation and construction hazards include the following: health challenges and loss of lives; loss of means of livelihood; climate change and global warming; reduction in ecosystem adaptability; loss of habitats; loss of property among others. However, there must be a concerted effort on the part of humans who live and use resources from the environment and the governments at all levels in addressing the issues of environmental challenges in order to eliminate or reduce these negative effects. Thus, it is advisable that everyone should be aware of the consequences of environmental degradation, so as to plan and use natural resources effectively and efficiently in order to promote sustainable environment and development which is referred to environmental management.

II. THEORETICAL UNDERPINNING

The rapid rate of industrialization and urbanization in Nigeria and other developing countries has resulted in the depletion of the natural resources and other environmental challenges. Thus, the economic and social changes associated with urbanization such as rural urban migration, population growth, provision of infrastructure among others has created serious environmental degradation which inhibit sustainable human and economic development (Nazeer *et al*., 2016).

Environmental degradation or challenge is any crisis that occurs in an environment beyond the individual, community or societal control yet affects the living conditions of humans, flora and fauna' negatively. It is described as a form of unexpected occurrence and damage on the environment triggered by natural or manmade factors that is destructive or possibly detrimental to man and other components of the environment (Wright & Boorse, 2011; Enger & Smith, 2010).

The classification of environmental degradation according to (Joseph, 2009; Botkin & Keller, 2012) is based majorly on the nature of occurrences which are either natural (caused by nature, sudden and harmful) or artificial (manmade, induced by humans either by their errors, carelessness and or intent). It is also divided into two types namely major and minor depending on the nature of damage to humans and the other components of the environment.

Accordingly, Nazeer *et al.* (2016) asserted industrialization, urbanization and globalization are the three factors that gives rise to the different types of environmental degradation in developing countries. Environmental degradation include various forms of pollution. Pollution is defined as the release of harmful substances into the environment mostly with the receiving agents of air as emission, water as effluent and land as dumps and disposal to the detriment of the both the humans, plants and the environment in general (Ukpong, 1994). Thus, there are three categories of pollution. These include air pollution, water pollution and noise pollution.

Air pollution is an environmental problem which is a relationship between the number of people living in an area and the kind of human activities that takes place there. Thus, the higher the population and the human activities, the larger the amount of quantities of pollutant released to the environment and vice versa. Accordingly, air pollution is defined as the presence of one or more contaminants including dust, fumes, smoke, gases and smog in the outdoor atmosphere in substantial quantities and period and is injurious to the humans, plants and animals (Nazeer *et al*., 2016).

Water pollution on the other hand is the release of industrial waste, decomposed waste, solid mineral mining substances, household effluents and petroleum waste products into the water bodies such as rivers, oceans resulting in the water being unsafe for drinking and fish farming. Other forms of water pollution could be oil pollution due to spillage and erosion which also has its devastating consequences (Etuonovbe, 2009). Also, noise pollution is defined as the production of unwanted sound in the environment causing a lot of discomfort to humans. The causes range from uncontrolled noise production from automobile repairs, noise from industrial machines, use of generating plants as well as noise from vehicle movements and industrial plants.

Similarly, construction activities are also major contributors to various forms of environmental hazards despite its economic and social importance. For the purpose of this study, construction activities include the construction and provision of residential, institutional, industrial, entertainment, administrative, commercial and religious buildings. Also included are construction of roads, bridges, rails, car parks, transportation terminals as well as communication infrastructure that makes life comfortable and improve the economic development of nations. However, the provision of these facilitates by the construction industry sector exerts too much pressure directly on the environment resulting in the degradation of the environment. Consequently, despite the benefits of the construction works and projects to the economy and people, unsustainable planning, design and poor construction practices impact negatively on the built environment (Dadzie & Dzokoto, 2013).

In addition both off-site and on-site construction activities including the production, transportation and use of construction materials, produces a lot of waste, dust and releases toxic substances which causes serious impairment to the environment (Rohracher, 2001; Teo & Loosemore, 2001).

A. Effects of Environmental Degradation and Construction Hazards on the Built Environment

The effects of the various forms of construction activities and other forms of environmental degradation discussed above are numerous and varied. Studies from literatures on the subject from various authors indicate that each author outlines the effects from their own perspective under different subtitle. But this study have tried to combine the various opinions of several authors in order to summarise the effects for clearer understanding.

Consequently, several authors namely Santa (2011), Jay & Scott (2011), Nazeer *et al.* (2016), Cardoso (2005), Shen & Tam (2002), Chen *et al*. (2005) and Ametepey & Ansah (2014) among others have outlined the various effects or impact caused by environmental degradation exploration and construction activities on the built environment to include biodiversity loss, loss of genetic resources, loss of lives, loss of properties, environmental degradation, loss of habitats, climate change and global warming. Other effects are reduction in ecosystem adaptability, epidemiological threat, disturbance of human activities, reduction in ecosystem adaptability, poverty of affected communities, damage to public drainage systems, destruction of plants, visual impact, noise, traffic increase and parking space.

Similarly, soil and ground contamination, underground water contamination, construction and demolition waste, noise and vibration, dust, hazardous emissions and odours, landscape, traffic, energy, timber consumption, sewage, and health and safety hazards, wildlife and natural features impacts and archaeology impacts are also some of the effects of construction activities.

These challenges are numerous and varied according to the views of different authors. Thus, this study has grouped these effects into 14 categories for better and clearer understanding for respondents to be able to easily identify the rankings of the effects appropriately.

III. METHODOLOGY

Methodology of study include the use of structured questionnaires distributed to stakeholders in the environment namely environmental scientists, Surveyors, Engineers, Architects, project managers and farmers selected from Niger Delta States of Bayelsa, Delta and Rivers using purposive random technique. The effects of degradation and construction hazards in these region which have been outlined formed the basis for the development of the questionnaires. A total of 200 structured questionnaires were developed using a 4-point Linkert scale namely (4= strongly agreed, 3= agreed, 2= disagreed, 1= strongly disagreed). These were distributed to stakeholders in the environment namely environmental scientists, architects surveyors, engineers, and resident farmers selected from three Niger Delta States of Bayelsa, Delta and Rivers respectively using purposive random sampling techniques. 145 of the 200 questionnaires were retrieved indicating 72.5% response rate which according to Kobbacy (2013) is acceptable based on the sample size. The retrieved data was analysed by the Relative Importance Index (R.I.I.) using the formulae: R.I.I. = (4n4 + 3n3 + 2n2 + n1)/4N (where n is the number of respondents; n4= strongly agreed, n3= agreed, n2= disagreed, n1= strongly disagreed).the results is presented in tables.

IV. RESULTS AND DISCUSSIONS

TABLE I: RELATIVE IMPORTANCE INDEX AND RANKING OF EFFECTS OF CONSTRUCTION ACTIVITIES

Sn	Effect	1	2	3	4	RII
1.	Health & safety impairment	-	-	30	115	0.9660
2.	Pollution (air, land, water)	-	-	35	110	0.9520
3.	Loss of farming/fishing jobs	-	5	30	110	0.9450
4.	Local issues (noise, odour, vibration)	-	-	47	98	0.9400
5.	Bio-diversity loss	3	7	25	110	0.9340
6.	Dust & waste generation	-	5	50	90	0.9172
7.	Distortion of ecosystem	5	10	30	100	0.9103
8.	Flooding/erosion	-	5	40	90	0.9100
9.	Climate change/emissions	-	18	40	87	0.8952
10.	Poverty on communities	-	12	55	75	0.8830
11.	Loss of genetic resources	-	10	70	65	0.8800
12.	Landscape alteration	-	20	63	60	0.8441
13.	Accident & Fire outbreaks	-	65	55	25	0.7500
14.	Traffic & Visual issues	-	65	55	25	0.7500

Source: Author's field work.

From the table above, the respondents were asked to rate the most impact or effect of environmental degradation and construction hazards on the environment, humans and other components of the environment. After the calculations of the relative importance index (R.I.I) of the responses, values of the various effects clearly revealed differences in the R.I.I. which indicates the rankings (from the most to the least) and form the discussion.

The responses shows that health and safety impairment with R.I.I value of 0.9660 ranks first. This means that the health and safety of the people residing in the areas are seriously affected by the degradation and construction hazards which in turn determine the wealth and longevity of the inhabitants because health is life and wealth. Second on the R.I.I value with 0.9520 is pollution (air, land and water). It is the views of the respondents that degradation and construction hazards causes a lot of air pollution, land pollution and water pollution. The pollution of these components of the environment affects the people very seriously. Next to pollution in the third ranking is loss of farming and fishing works or jobs with RII of 0.9400. This ranking may not be unconnected with the occupation of the people of this region, hence it is one of the most serious negative effects of degradation and construction hazards. The occupational activities of the people is hampered with many losing their source of livelihood to the detriment of the larger society.

Furthermore, ranking fourth is local issues (noise, odour and vibration) with R.I.I value of 0.9400. The respondents have observed that construction hazards produce a lot of noise, generate dust and produce vibrations which also negatively affect the people. The fifth most serious effects of degradation and construction hazards on the built environment is the bio-diversity loss with a R.I.I value of 0.9340. Bio-diversity loss include vegetation removal, loss of edaphic soil and interception of water bodies. Following this in sequential order are the sixth ranking (dust and waste generation) with R.I.I value of 0.9172, seventh is distortion of ecosystem with R.I.I of 0.9103; flooding and erosion ranked eight with R.I.I of 0.9100; climate change & emissions is ranked ninth with RII of 0.8952; poverty on communities is ranked tenth with RII of 0.8830; loss of generic materials (raw materials, energy, water) is ranked eleventh with RII of 0.8800. The twelfth ranked effect with a R.I.I value of 0.8441 is landscape alterations while the least of these effects ranked thirteenth and fourteenth have same value of R.I.I as 0.7500 each and they are accident/fire outbreaks and traffic & visual issues respectively.

V. Conclusion

The study examined the effects of degradation and construction hazards on the built environment in Nigeria using three Niger Delta States of Bayelsa, Delta and Rivers respectively. It is very obvious from literatures that exploration and construction activities cannot be carried out outside the environment and that they are also very beneficial the growth and development of the economy. However, inefficient and uncoordinated construction practices and degradation causes so much damages and harm to the environment and its components parts including humans residing there. Respondents across the three States expressed their opinions in the rankings of the various effects numbering over 30 but categorized into 14 namely health & safety impairment; local issues (noise, odour, vibration); accident & fire outbreaks; loss of genetic resources; landscape alteration; climate change/emissions; poverty on communities; loss of farming/fishing jobs; bio-diversity loss; distortion of ecosystem; flooding/erosion; pollution (air, land, water); dust & waste generation and traffic & visual issues.

The study revealed that respondents ranked health and safety impairment as the most significant effect of degradation and construction hazards followed by pollution (air, land and water) and loss of farming and fishing jobs as second and third most significant effect respectively. The study also showed that traffic and visual issue as well as accident and fire outbreaks were the least significant effects.

The study however recommend the following steps to be taken in order to have a sustainable built environment. These include use of renewable energy sources; recycling of building materials; sustainable designs (climate & site responsive designs); sustainable construction practices and enforcement of environmental protection policies by relevant agencies.

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