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An Assessment of Environmental Impacts of Building Construction Projects

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Abstract

The environment is threatened severely by so many problems, some of which are caused by the activities of Construction Projects. The global concern to address environmental degradation caused by various developmental actions (construction projects inclusive) is the basis for calls to assess environmental impacts of building construction projects in Nigeria. Data for the study were collated through a questionnaire survey administered to stakeholders of Nigeria's building construction industry. Data collected were analysed and ranked using Relative Importance Index (RII), result shows impacts listed are above the mid (RII) index of 3.0 suggesting that they significantly impact on the environment thereby causing environmental degradation. The research also reveals major environmental impacts of building construction projects to include environmental pollution, resource depletion and habitat destruction causing Destruction of ecosystem, Desertification, Soil Erosion and increasing Material Wastage. Waste Management, Pollution Control and Ecology Conservation were ranked as the most important environmental protection measures used in controlling building construction environmental impacts. The study therefore suggest that in order to reduce environmental degradation, building construction stakeholders must adopt fully environmental impact assessment document and other regulations relevant for environmental protection. Also, all environmental regulatory agencies and sensitization organizations should continuously sensitize the building construction public on requisite environmental management practice and sanction erring agents.

Keywords: Environmental Impacts; Building Construction Projects;

1. Introduction

For the sustenance and dynamism of livelihood, every growing society is characterized by the erection of either permanent or temporary structures for the purpose of shelter which is the second necessity of life (George, 2002). The quest for housing has tremendously increased urbanization and the built environment resulting in various environmental impacts and environmental degradation which is recently being traced to human activities with construction projects/works taking a lion's share. Environmental Impact according to Rubin and Davidson (2001); Babawale (2004); CIOB (2004) and Majumdar (2006), are used to describe some implications of human activities on the environment. At the highest level, this includes the study of interactions among all forms and activities of the environment. More commonly, Environmental Impact refers to effects of human activities on his environment (Bertone, 1991). According to Federal Environmental Protection Agency (FEPA) (2008), the various environmental impacts may be connected to the mass flooding in Ibadan and Lagos cities of Nigeria as a result of blockage of water ways and channels. Also the mass pollution of water and air in Brass Island of Bayelsa is also traced to human activities like mining, refining and construction activities (FEPA, 2008). The menace is also affecting many other cities in the world like the alarming rate of pollution in Abu Dhabi city of the United Arab Emirate (UAE) and Pittsburgh- a densely industrialized city of the United State of America which has the highest record of air pollution because of manufacturing of Construction equipment (UNESCO, 2003).

The concurrence reclamation and development in Lagos (Island) Peninsula is the major cause of the recent flooding in Lagos Island. The coast into which the lagoon extents its banks at the high tide periods has been built up, thereby causing the lagoon to overflow its banks resulting in flooding. A review made by Koleosho and Adeyinka (2006); Horsley (2003) and Hardy (2007), also shows the need for cross examination of the activities of the built environment that causes Environmental changes so as to identify their impacts for the purpose of mitigation. This is corroborated by the UN-Habitat report in Nigeria (2004) that "The design, construction, maintenance and use of

structures have impacts on the environment; some of these significant impacts include Energy Impact, Ecological Impact, Visual Impact as well as Material impact". Building construction projects in Nigeria have both direct and indirect impacts on the environment. The identification of likely impacts on the environment in order of severity is a task that needs to be accomplished for the realization of a minimum effect of construction project on the environment (Koleosho and Adeyinka, 2006). Section 38 of the 1991 Act of Federal Environmental Protection Agency of Nigeria defines the environment as including water, air, land and all plants/animals or human beings living therein as well as the inter-relationship that exist between and among them. To this effect, the impacts of building construction projects are felt by all the elements that constitute the Environment (Howard 2000 and Chrisna, 2006).

The process of identifying, predicting, evaluating and mitigating the biophysical, social and other relevant effects of developmental proposal prior to major commitment is Environmental Impact Assessment (EIA) (Barlett and Prior, 1991). According to International Association for Impact Assessment Act (IAIA, 2000), the purpose of EIA is to ensure that decision makers consider all possible impacts and their respective effects when deciding a project. In view of this, it should be used as a decision making tool rather than decision aiding tool. In Nigeria the activities of the international impact assessment act are not felt which result to increase in pollution and other environmental degradations. Environmental protection requires activities on many levels; from preventing global warming to safeguarding living beings. The effects of poor air quality or toxic chemicals and supporting basic necessities must also be considered for the survival of men. The propounded ways by the UN-Habitat in Nigeria (2004) to protect and save our environment include, the use of environmental effective housing through improved energy efficiency of buildings and an effective economic growth through more efficient use of resources such as re-use, recycling and recovery of waste. The National Environmental Pollution Act 1969 (NEP) has also empowered many government agencies to actively monitor the air for pollutants, inspect emission sources, provide compliance assistance to industries as well as initiate enforcement actions such as educating the public about the air quality issues. They are equally involved in the prevention and regulation of water pollution from industries, municipal sewage treatment facilities as well as monitoring constructi0on sites and urban areas. All these are mitigating measures to reduce the impact of construction projects on the environment but their application and enforcement need to be investigated in Nigeria.

Effective protection of the environment is critical to sustainable development but Dietz, York and Rosa (2001) opines that human development and growth will be short lived if we do not conserve the natural environment and its resources. In view of this, there is need to assess the basic environmental impacts of building construction projects to promote sustainability.

2. Environmental Impact

Identification of possible impacts of building construction projects on the environment is a task that needs to be accomplished for the realization of an effective environmental. Our environment is fast deteriorating in its ability to support life forms, with every large stride taken towards developments, ten strides are taken backward in our failure to protect the environment as well as save rare species from the danger of extinction (UN Habitat, 2006 and Sev, 2009).

A study by Dietz et al. (2001) opined that Environmental Impact can be gauged in the risk to human and ecological health as well as in the subtle but horrifying altering course of nature. This risks includes the dangers and changes to the quality of life that are determined by physical, chemical, biological and psycho-social factors which in turn shows how far the damage has been carried out.

According to Howard (2000), environmental impact can be classified into visual impact, material impact and resources use, energy impact, space condition and lighting impact and land use and ecological impact. Any building structure above the earth surface assumes visual impact on the environment. The public judgment on the appearance of buildings may however be relative and subjective as to the severity of the impact. This is perhaps the reason that until now; it has been difficult to regulate and control the appearance of buildings. Hence, the importance of building design with respect to the existing built environment is worth considering.

Impacts considered from building materials could be addressed at different stages; from processing and manufacturing to logging and storage through installation and use. The construction industry is the major consumer of all resources of all industries in Nigeria. It accounts for 90% of all non-fuel mineral use, and a large proportion of timber use (Howard, 2000). The impact from processing and manufacture is not usually restricted to energy consumption but includes the physical degradation around mines, which includes lost of topsoil and forest

All types of buildings are consumers of power. Janda and Busch (1994) supported this assertion with research that concluded that 57% of electricity used in developed countries is consumed directly by buildings, out of which 31% is taken by residential buildings and 26% by commercial buildings this makes building construction a source of environmental impact in Nigeria.

On-site activities require electricity for tools, machinery and for illumination. The use of petrol and fossil fuels by heavy equipments directly contribute to atmospheric pollution. In habitable buildings, energy could be used for many purposes such as for space heating and cooling, lighting, domestic hot water and to operate various appliances. However, with the inadequacy of electricity supply in Nigeria, the use of alternative sources of power; mostly generators powered by petrol or diesel make the situation worse still.

Another source of environmental impact is Burning coal to produce steam for electricity. Large amounts of Green house gases (GHG) as well as causing local environmental damage. Coal accounts for the most carbon-intensive fossil fuel, releasing more than 29% more carbon per unit of energy than oil and over 80%more than gas (Planet Ark, 1999).

A significant amount of energy is devoted to heating, ventilation and air conditioning (HVAC) systems. For instance, in Nigeria, HVAC account for about 50% of the energy consumed in commercial buildings as against 15% used for lighting. Since much of the energy is in the form of electricity, it contributes much to GHG emission. HVAC systems in city buildings like Lagos, Ibadan and Akure contribute to urban heat. This occurs when cities experience higher temperatures than surrounding rural areas due to high heat absorption by paved areas. Buildings Space Conditioning systems contribute to this effect by removing heat generated by human activities into the air. The HVAC components themselves generate additional heat, which add to the amount of heat that is dissipated into the environment. This explains the phenomenon where temperatures in urban areas are higher that the surrounding rural areas. A rise of average of just 2^0C summer temperature would make a large number of naturally ventilated buildings hot, as a result of increased demand for air conditioning (Barlett and Prior, 1991). Lighting in buildings is more or less exclusively provided by electrical means and therefore adds to the greenhouse problem in the same way that any electrical appliances or installation does.

Ecology is the study of how organisms interact with their environment, more commonly, the term ecosystem is used to refer to any biological community that functions as a cohesive unit within its physical environment (Rubin and Davidson, 2001). Examples of such units include, among others, forest ecosystem, aquatic ecosystem and desert ecosystem. The basic message from the study of ecosystems is that everything is connected to everything else, even though these links may not be obvious or immediate. Thus, major disruptions for the earth's ecosystems caused by human activities invariably will have implications for the people as well as other living things. This type of holistic perspective is extremely useful in understanding the environmental consequences of building construction projects in Nigeria.

3. Methodology

The research design was based on relevant literature according to Howard (2000); Dietz et al (2001); Chrisna (2006); Vanikar (2007) and Brundtland (2007) who have carried out researches on environmental disasters, environmental sustainability and the green house effects on the built environment. A non probability convenience sampling method was adopted; this is a sampling method according to Teddlie and Yu (2007) and Collins, Onwuegbuziu and Jiao (2007) that involves choosing from a sample that is not only accessible but the respondent are willing to take part in the study. Data for the study were collated through a survey questionnaire administered to participants on building construction shareholders in Ondo, Lagos, Ekiti, Edo, Oyo and Delta state. These places where selected because of

disasters that occur frequently in these regions. The population for the study comprised of clients/developers, contractors, consultants, manufacturers, professional bodies, trade unions and the Standard Organization of Nigeria (SON) who are involved in building construction projects. A total of 40 questionnaires were distributed but 34 (85%) were retrieved which was used for the analysis. Two statistical methods were used to analyse the data provided by the questionnaire. The first was to acquire percentage values through frequencies of the answers received. The other was to calculate a Relative Importance Index (RII). For this purpose, a rating scale of 1 to 5 was adopted with 1 representing the lowest level of effect and 5 representing the highest level of effect. The RII was evaluated using the following expression.

$$RII = \frac{\sum_{i=1}^{5} W_i X_i}{\sum_{i=1}^{5} X_i} \quad (1 \le RII \le 5)$$

The respondents were asked to indicate how a list of related impacts of building construction projects affects the environment negatively. (In terms of "strongly important", "important", "neutral", "not important" or "strongly not important"). The "importance index" was derived for each factor using the following formula (Lim and Alum, 1995).

4. Results and Discussion

The result of the analysis of the participants on building construction projects are prepared below:

Table 1; Nature of the Organization

Organization	**Frequency**	**Percentage**	**Cumulative**
Private	21	61.77	-
Corporate	3	8.82	61.77
Public	9	26.47	70.59
Others	1	2.94	97.06
Total	34	100.00	100.00

From Table 1 in the statistics presented, it is observed that majority of respondents (61.77%) work with private organization and 26.47% work with public organizations. The Nigerian Construction Industry has the involvement of both the private and public sectors which should encourage the assessment of impacts of their respective projects on the environment.

Table 2; Type of Projects Executed by the Organization

Nature of Project	Frequency	Percentage %	Cumulative
Building	11	32.35	-
Civil	4	11.77	32.35
Building/Civil	17	50.00	44.12
Others	2	5.88	94.12
Total	34	100.00	100.00

Most of the construction companies carry out both civil and building projects while only few companies carry out civil or building construction separately as recorded in Table 2. Companies that registered for just civil or building should not be allowed to carry out construction works in other areas without the statutory backing or employing professionals in such field. This will help in assessing the impacts associated with the environment on each project.

Table 3; Highest Academic Qualification of Respondents

Qualification	Frequency	Percentage %	Cumulative %
HND	16	47.06	
B.Sc/B.Tech	8	23.53	23.53
PGD/Master	8	23.53	23.53
Ph.D	-	0.00	0.00
Others	2	5.88	5.88
Total	34	100.00	100.00

The qualifications of respondents were recorded in Table 3. The result shows that Higher National Diploma (HND) has the highest of respondents while Ph.D. has the lowest. This indicates that majority of the respondents have at least a Higher National Diploma or its equivalent in construction/ environmental related activities. The result implies that the Nigeria Construction industry has the involvement of workers with adequate academic qualifications which should practice impact assessment in other to achieve the desired goal of the project.

Table 4 Professional Discipline of Respondents

Discipline	Frequency (f)	Percentage (%)	Cumulative %
NIOB	16	47.06	-
NIA	6	17.65	47.06
NIQS	4	11.76	64.71
NSE	6	17.65	76.47
NIESV	1	2.94	94.12
Others	1	2.94	97.06
Total	34	100.00	100.00

Table 4 shows the professional discipline of the respondents and the result indicate that Building have the highest number of respondent while Estate surveyors have the lowest. The also review that the Estate surveyors really participate in Environmental Impact Assessment since they are neither involved in design nor the actual building production process. The Builders, Architects, Civil Engineers are more involved in the design and production of buildings in Nigeria.

Table 5 Working Experience of Respondents in the Construction Industry

Years of experience	**Frequency (f)**	**Percentage (%)**	**Cumulative**
0 – 5 years	7	20.59	-
5 – 10 years	13	38.24	20.59
10 – 15 years	8	23.63	58.83
15 – 20 years	4	11.76	82.36
Above 20 years	2	5.88	94.12
Total	34	100.00	100.00

Table 5 shows the working experience of respondents in the construction industry. The result indicated that 58.83% of the total numbers of respondents have been practicing in the construction industry for about 10 years. This implies that most of the workers in the construction industry are experienced and can be trained as worker on environmental impacts assessment of construction projects.

Table 6 Number of Projects Executed by the Various Construction Companies

Number of Project	Frequency (f)	Percentage (%)	Cumulative
1 – 5 projects	6	17.65	-
5 – 10 projects	13	38.24	17.65
10 – 15 projects	12	35.29	55.89
15 – 20 projects	2	5.88	91.18
Above 20 projects	1	2.94	97.06
Total	34	100.00	100.00

From the Table 6, it is observed that most of the construction companies have executed more than 5 projects (82.35%). This indicates that the involvement of large construction industries in the assessment of Environmental Impact will go a long way in reducing the adverse effects of these impacts on the environment.

The Results of the question "Assess the following environmental impacts of building construction projects" was recorded in Table 7 below. It indicated that out of the 14 impacts listed in the questionnaire the three most important impacts were pollution, resource use and habitat destruction. Visual Impact was ranked lowest while the mean responses of all items are above the mid- severity index of 0.5 suggesting that there are all significant environmental impact of building construction projects.

The highest environmental impact of construction is felt in terms of pollution. According to Dietz et al (2001), "The construction industry is a major source of pollution responsible for about 4% particulate emissions, more water pollution incidents than any other industry, and thousands of noise complaints every year. Although, construction activities also pollute the soil, the main areas of concern are: air, water and noise pollution. There was a simple general equation between the amount of pollution and the amount of energy in process. On the whole, the more energy required, and the more processes, the more waste and the more pollution is generated (Horvath, 2004). Processes such as the processing of plastics for PVC, PU and PI, the manufacture of Titanium Dioxide, the galvanizing of metals were all very polluting. And again, not surprisingly, the construction industry has the biggest effect on all sectors because of the quality of materials used in construction.

Construction activities that contribute to air pollution include: land clearing, operation of diesel engines, demolition, burning and working with toxic materials. All Construction sites generate high level of dust (typically from concrete, cement, wood, stone, silica) and this can carry a large distance over a long period of time. Sources of water pollution on building sites include: diesel and oils; paints, solvents, cleaners and other harmful chemicals; and construction debris and dirt (Janda et al., 1994). When land is cleared, it causes soil erosion that leads to silt-bearing runoff and sediment pollution Construction sites produce a lot of noise mainly from vehicles, heavy equipments and machineries and also people shouting as well as radio turned up too loud. Howard (2000) opined that excessive noise is not only annoying and distracting, but can lead to hearing loss, high blood pressure, sleep disturbance and extreme stress.

Another environmental building construction activity of great impact is the use of resources like timber and non- fuel materials. This leads to habitat destruction, loss of arable land, loss of arable land and loss of biodiversity. While the three greatest and most imminent threats to the survival of our civilization are global warming, peak oil (the growing energy gap between supply and demand) and resource depletion. Sometimes, these can also have a global impact, for example the impact of deforestation of the Amazon rain forest (UN-Habitat, 2002).

Table 7. Assessment of Environmental impacts Of Building Construction Projects

Environmental Impacts	**Degree of occurrence quoted by 34 Respondents[a]**					**% Score**	**RII**	**ST. DEV.**	**rank**
	5	4	3	2	1				
Visual Impact									
Visual Disturbance	8	8	10	6	2	116	3.41	3.0332	12th
Urbanization	5	10	8	8	3	108	3.18	2.7749	13th
Increase in Population	5	5	14	7	3	104	3.06	4.2662	14th
Material Impact									
Manufacturing of Constr. Materials	10	10	5	6	3	120	3.53	3.1145	11th
Storage of Constr. Materials	9	11	8	5	1	124	3.65	3.8987	10th
Installation & use of Constr. Materials	13	9	7	3	2	130	3.82	4.4944	8th
Ecological Impact									
Loss of Arable land	18	8	6	2	0	144	4.24	7.0143	4th
Habitat destruction	23	6	4	1	0	153	4.50	9.3648	3rd
Storm water/erosion	19	9	3	2	0	144	4.24	7.7007	4th
Pollution	22	8	4	0	0	154	4.53	9.1214	1st
Energy Impact									
Energy consumption (Fuel)	16	6	4	5	3	129	3.79	5.2631	9th
Power (electricity) Consumption	17	9	4	2	2	139	4.09	6.3797	6th
Increase in Temperature	19	7	3	2	3	139	4.09	7.0852	6th
Resource Use (Timber, non-fuel materials)	20	9	3	1	1	148	4.35	8.0747	2nd

Note: a1 – always occurred; 2 – usually occurred; 3 – sometimes occurred 4 – Neutral; 5 – never occurred

Table 8. Results of Ranking of Building Constructions Related Factors That Causes Environmental Impacts

Building Construction Related impacts	**Degree of severity quoted by 34 Respondents[a]**					**% Score**	**R11**	**ST. DEV.**	**Rank**
	5	**4**	**3**	**2**	**1**				
Destruction of Vegetation	17	10	5	1	1	143	4.206	6.797	1st
Desertification	16	8	7	3	0	139	4.088	6.058	2nd
Waste disposal	15	10	5	4	0	138	4.059	5.805	3rd
Soil Erosion	13	12	7	1	1	137	4.029	5.762	4th
Material Wastage	15	10	5	2	2	136	4.000	5.630	5th
Noise from Construction Operation	14	11	5	2	2	135	3,971	5.450	6th
Greenhouse effect	11	12	9	0	2	132	3.882	5.450	7th
Energy Wastage	12	10	7	3	2	131	3.842	4.324	8th
Water pollution	11	12	7	2	2	130	3.824	4.439	9th
Global Warming	12	10	7	4	0	129	3.794	4.970	9th
Dust	11	12	5	4	2	128	3.765	4.439	11th
Flooding	12	9	7	4	2	127	3.735	3.962	12th
Air Pollution	13	10	4	3	4	127	3.735	4.439	12th
Visual disturbance	10	10	7	4	3	121	3.559	3.271	14th
Natural Disaster	9	10	8	4	3	120	3.529	3.115	15th
Spillage	10	9	6	7	2	120	3.529	3.115	15th
Climate Change	9	10	7	5	3	119	3.500	2.864	17th
Loss of Wild life	10	7	8	5	4	116	3.412	2.388	18th

Note: a5 – Extremely severe; 4 – very severe,; 3 – severe; 2 – slightly severe; 1 – not severe

Table 8 presents the list of the factors considered to contribute to the Environmental Impacts (Visual, Material, Ecological and Energy) of Construction Projects and the average of all the significant indexes is calculated. Destruction of Vegetation has the highest average index of 4.206 while Loss of Wild life trails the lowest average index of 3.412. The average index was calculated from the indexes of all the Environmental Impacts (Visual, Material, Ecological and Energy). All the causes of environmental impacts listed are above the mid (RII) index of 3.0 suggesting that there are all significant causes environmental impact and environmental degradation.

Table 9 Results of Ranking of Environmental Protection Measures

Environmental Protection Measures	**Degree of Occurrence quoted by 34 Respondents[a]**					**% Score**	**R11**	**ST. DEV.**	**Rank**
	5	**4**	**3**	**2**	**1**				
Waste Management	**14**	**10**	**7**	**2**	**1**	**136**	**4.000**	5.44977	1st
Pollution Control	**12**	**9**	**8**	**3**	**2**	**128**	**3.765**	4.20714	2nd
Ecology Conservation	**9**	**13**	**7**	**4**	**1**	**127**	**3.735**	4.60435	3rd
Energy Conservation	**10**	**9**	**6**	**7**	**2**	**120**	**3.529**	3.11448	4th

Note: a1 – Strongly important; 2 – Important; 3 – Neutral; 4 – Not important; 5 – Strongly not important

Table 9 below, shows the various methods of environmental protection considered in relation to their respective level of significance in dealing with various environmental impacts caused by construction activities. Waste Management, Pollution Control and Ecology Conservation were the three most important protection measures. All the measures are significant with RII above 3.0

Construction wastes are generated from the manufacture of Construction materials, demolition and from accidental wastage on site. The resource efficiency of building materials would be increased if there were measures put in place to reduce waste in the manufacture process. These measures include Recycling of material to create new products to reduce construction waste. Recycling of materials means that the embodied energy can be preserved thus implying more sustainability and optimum waste management.

Another major Protection Measures suggested by the respondents is pollution control. Good construction site practice can help to control and prevent pollution. The first step is to prepare environmental risk assessment for all construction activities and materials likely to cause pollution. The World Health Organization (2004) guide specific measures which can be taken to reduce pollution risks on construction site. These guides should be implemented.

Energy conservation will improve the extraction, production and transportation of materials. The energy used in manufacture and transporting construction materials is usually very high. Natural materials which are generally lower in embodied energy and toxicity than man-made materials should be encouraged because, they require less processing and less damaging to the environment.

The use of ecology conservation has been retarded by the legislative bottlenecks, technical inadequacies, lack of manpower as well as the loopholes in the Land Use Decree 1978 in Nigeria. Community practice is also not encouraging ecology conservation. Planning is still basically “for the people”, rather than being “with the people”. Therefore, there is need to involve every individual in the conservation of our ecosystem as well as enforce every ecology conservation laws.

Table 10. Results of Ranking of Tools and Establishments for Environmental Protection

Tools and Establishments for Environmental Protection	**Degree of Occurrence quoted by 34 Respondents[a]**					**% Score**	**R11**	**ST. DEV.**	**Rank**
	5	**4**	**3**	**2**	**1**				
National Environmental Protection Board	11	12	7	2	2	130	3.824	4.76445	1st
Ministry of Environment	12	10	6	5	1	129	3.794	4.32435	2nd
Environmental Impact Assessment document	13	7	5	6	3	123	3.618	3.76829	3rd
Nigeria Conservation Foundation	10	9	8	5	2	122	3.588	3.27109	4th

Note: a1 – Strongly important; 2 – Important; 3 – Neutral; 4 – Not important; 5 – Strongly not important

Table 10 shows that the various agencies adopted globally for planning and for determining the potential environmental, social and health effect of a proposed development for the purpose of environmental protection. It is clearly seen on the table that National Environmental Protection Board, Ministry of Environment and Nigeria Conservation Foundation are the most three important agents used to control, sensitize and regulate environment disasters in Nigeria. This bodies protect Environmental Impact Assessment (EIA) document which is one of the fore-running tools to study, identify and improve on past, present and future environmental hazards

Nigeria Environmental Protection Board (NEPB) is a national tool established under the Land Use Decree of 1978 to guide against the abuse of the environment by Nigerians. This body is in charge of waste management, sewage maintenance as well as maintenance of other public utilities. NEPB is guided by the ethics of the Ministry of the Environment.

Ministry of the environment is a government institution that operates on the core values of Land Use Decree 1978. This body has autonomous power on all lands in Nigeria and it is saddled with the responsibility of Land allocation, revocation as well as issuance of certificate of occupancy.

Nigeria Conservation Foundation (NCF) is an organization sponsored by both government and non-government bodies to assist government agencies to develop and monitor the strict adherence to environmental protection laws. NCF was established in 1991 with the support of United Nation Habitat as well as other international conservation bodies. There is a general consensus that these agencies will reduce environmental degradation and enhance sustainable environment.

5. Conclusion

The fast growing threat of environmental impacts of building construction projects on the ecosystem needs revolutionary mitigating measures in all ramifications. Though, the environmental impacts of building construction activities may vary from country to country. The research revealed that the major environmental impacts are pollution, resource use and habitat destruction which is caused by destruction of vegetation, desertification, waste disposal, soil erosion and material wastage. All the impacts listed are above the mid (RII) index of 3.0 suggesting that there are all significant environmental impact and causes of environmental degradation by building construction projects. Waste management, pollution control and ecology conservation were ranked as the most important

environmental protection measures used to control building construction environmental impacts. The study therefore subjects the use of Nigeria environmental protection board, ministry of the environment, environmental impact assessment documents and Nigeria conservation foundation to reduce environmental degradation and enhance sustainable environment. These findings should serve as a guide in developing a framework for mitigating measures associated with Construction Projects in Nigeria. Implementation of environmental planning and management methodologies based on stakeholder's involvement should be adopted in the construction industry and government should initiate sustainable construction measurement and management practice in Nigeria.

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