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Building Industry Professional Attitude Towards Construction And Demolition Waste Hazards In Lagos Metropolis, Nigeria

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Abstract
The management of environmental hazards is of great concern to stakeholders within the construction industry being the major consumer of environmental resources. The quantity of construction and demolition (C&D) wastegenerated by cities is increasingdue to rapid economic development, urbanization, and the need for massive construction to accommodate the teeming population. Most often, the quantity of this waste is unknown, with little attention given toproper disposal, making this waste hazardous to the environment. This research focuses on the building industry's professional attitude toward construction and demolition waste disposal with a view to mitigatingenvironmental hazards. A quantitative random sampling technique was used in the selection of 180 building industry professionals (BIP) respondents among whom were Architects, Engineers, Quantity Surveyors, and Builders. The result showed that the majority (63.3%) of the BIPs are not involved in the disposal of construction and demolition waste while (36.7%) are not directly involved. Therefore it is recommended that continuous enlightenment should be carried out among the BIPs to mitigate against construction and demolition waste hazards while government should provide incentives for proper C & D waste management among the construction professionals.

***Keywords**: Building Industry Professional; Construction and Demolition waste; Environmental Hazards;Lagos Metropolis; Waste Management.*

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I. Introduction

Cities are producing more construction and demolition (C&D) waste due to urbanization, rapid economic growth, and the need for extensive construction to support the burgeoning population (Kabirifar et al., 2020; Ogunmakinde et al., 2019).Construction and demolition waste are an integral part of the general waste generated within the municipality and usually constitute the bulk of the waste. These wastes are often disposed of indiscriminately (Kabirifar, Mojtahedi, Changxin Wang, et al., 2020; Kabirifar & Mojtahedi, 2019; State & Engineering, 2019), and these constitute the sources of environmental hazards.The construction sector is the largest environmental resource user and is highly concerned with managing environmental hazards(Narcis et al., 2019). Most frequently, the amount of this waste is unknown, and safe disposal is not given much thought, making it dangerous to the environment.These wastes are residues from concrete, reinforcement steel, plywood, plastics, and other packaging materials which when they are mismanaged become hazardous to the community ranging from pollution, obstruction, contamination, and issues of safety that are inimical to human health and wellbeing (Aboginije et al., 2020; Ogechukwu, 2020; Tamiz Uddin et al., 2021).However,addressing rising construction and demolition waste management requires techniques, the input of various building industry professionals, and the dedication of governmental organizations (stakeholders).

There have been continual initiatives to reduce waste at all stages of building in an effort to accomplish more with less.The volume of C & D waste generation in Lagos metropolis requires careful attention becauseit has become the nation's commercial nerve with it continuing to experience rapid population growth, projected at 6–8% per annum and the amount of waste generated in the country construction projects varies from 15–20% (Adewuyi & Odesola, 2016; Wasiu & Clement, 2017). This study aimed at evaluating the construction and demolition waste hazards in the building/construction industry in Lagos metropolis with a view to mitigate it. This shall be done following the objectivesof assessment of BIPs demographic characteristics in the study area, BIPs involvement in waste attitude toward construction and demolition waste disposal, and evaluating the relationship between waste disposal involvement and environmental hazards.

II. Literature Review

Lagos is a nerve of commercial center in Nigeria. It is a coastal city on West Africa's Atlantic seaboard, the most populous and smallest in area out of the 36 States in Nigeria.Lagos State is divided into five administrative divisions, which are further divided into 20 local government areas, or LGAs.16 of which comprise the statistical area of Metropolitan Lagos. The remaining four LGAs (Badagry, Ikorodu, Ibeju-Lekki and Epe) are within Lagos State but are not part of Metropolitan Lagos.The Lagos metropolitan area includes Lagos Island (IsaleEko), the former administrative seat, Ikoyi, and Victoria Island. Several old but planned areas of Apapa, EbuteMetta, Yaba, Ilupeju, Surulere and Ikeja arose with increasing commercial activity and industrial growth. Several newly planned towns and estates such as Festac Town, Satellite Town, Gowon Estate, Ipaja, AmwoOdofin and Anthony Village. Ancient and local villages such as Musin, Iwaya, Iponli, Maroko and Ajegunle.The daily rising population due to rural to urban migration and Lagos being an economic stateincreased construction activities(Oke et al., 2019) translating to higher waste generation compared toneighboringcities. These wastes come in various forms while this study focused mainly on construction and demolition wastes.

2.1 Waste Management

Waste is a byproduct of different operations ranging from domestic, industrial, construction, health, agricultural among others. The term usually refers to materials produced by human activity (Amasuomo& Baird, 2016) and is generally assumed to have effect on health, the environment or aesthetics. The type of waste informs its management style as two types cannot be treated the same way. The complexity of the management of each type is determined by the level of hazards it will cause to both the human and environment if not properly controlled. Kaza et al., (2018) opined that the world is on track to more than double waste generation by 2050, dramatically outstripping population growth. Cities with increased economic activity have huge amounts of waste, including hazardous and toxic waste(*Mushtaq Ahemd MEMON*) as the high degree of urbanization in African countries implies a rapid accumulation of waste(Yoada et al., 2014). The daily increase of waste has resulted in a concerted efforttowardsproper management to reduce human and environmental exposure to disaster.

Waste management according to Bacinschi et al. (2010) is the collection, transportation, treatment, recycling or disposal and control of waste materials. It can also be referred to as prevention, minimization, reuse, recycling, recovery and disposal (Bacinschi et al., 2010). UN-HABITAT has reported that in recent decades, rapid urbanization, low levels of revenue collection and competing needs have strained the capacity of many local authorities from providing efficient waste management services, steadily reducing the scope of services and degrading the quality of services provided(Coffey et al., 2010).Millions of people live in developing countrieswithout waste management system, with widespread landfills in water bodies and uncontrolled landfills(Folorunsho, 2016) which is common with construction and demolition waste. Some scholars have considered the management of C and DW from a hierarchical perspective including the reduction strategy of C&DW, the C&DA reuse strategy and the C&D recycling strategy(Kabirifar, Mojtahedi, Wang, et al., 2020).

2.2 Building Industry Professionals

The key professionals in the construction industry, identified are, Architects, Project Managers, Civil Engineers, Structural Engineers, Mechanical Engineers, Electrical Engineer and Quantity Surveyors. All these professionals have a stake in both construction and demolition waste as the action and inaction from the design to construction stage can increase or reduce the quantity of waste generation on site. Osman et al. According to Oke et al. (2019), waste is generated during the construction phase. However, there are waste reduction methods that can be applied before construction starts that are more effective than those applied during the construction phase. These phases are the design phase and the procurement phase as Hussin (2018) expressed that, buildings usually includes translation paper or computer to make the base design a reality in the modern industrialized world.

2.3 Construction and Demolition waste

Construction and demolition waste are all materials generated during or after construction or demolition activities, these activities could be new construction (of buildings, bridges, roads etc.) or renovation / remodeling, total demolition or partial demolition.The construction industry consumes huge natural resources and produces a lot of waste.It is difficult to estimate the amount of construction and demolition waste produced and its composition varies, but it can include concrete, brick, earth, stone, plaster, lumber, shingle, plumbing and electrical parts (Ghafourian et al., 2018). They are usually solid waste and their management is important but often overlooked while planning cities and communities that are sustainable, healthy and inclusive for all(Kaza et al., 2018).

Plate 1: Construction and demolition waste

The uniqueness of construction and demolition waste/debris has placed them under bulky waste being entirely different from household waste and is collected using alternative heavy-duty vehicles and equipment (Coffey et al., 2010). Solid waste disposal methods are almost the same as general waste disposal methods, and include general waste landfill which could be semi-technical, controlled or uncontrolled landfill.Cities around the world generate approximately 1.3 billion tons of solid waste each year. According to a 2012 World Bank report, this amount is expected to rise to 2.2 billion tons by 2025(Asia Company Limited for the PRC Ministry of Housing et al., 2018). A total of 35% of the world's construction and demolition waste is estimated to be landfilled(Kabirifar, Mojtahedi, Wang, et al., 2020). Therefore, effective management of C&D waste is essential to minimize the harmful effects of C&D waste on the environment. The issue of construction site sustainability remains an unsolved challenge for most countries. Construction and demolition waste (CDW) problems have a negative impact on the country's environment, economy, productivity, and society(Ghafourian et al., 2018).

2.4 Environmental Hazards

The term environmental impact/hazards have become distinctive, particularly with regard to the challenges of global warming and the pursuit of green development, and has provided a definition for the environment sustainability. "Environmentally sustainable organizations use natural resources that do not exceed production rates and control their emission levels so as not to exceed the ecosystem limit to absorb and clean up the atmosphere". They further expressed that C&DW also leads to global warming. For instance, by processing each ton of C&DW in a landfill site, 200 lbs. emissions susceptible for global warming is released (Kabirifar, Mojtahedi, Wang, et al., 2020). The composition (type and quantity) of solid waste buried in landfills is an important determinant of the types, quantities and characteristics of the by-products emitted into the air and into the soil (Environmental Protection Agency & of Resource Conservation, 2020).

Construction and demolition waste due to improper management can cause environmental hazards. These ranges from land occupation through stockpiling, water, air and soil pollution. Toxic components of CDW generated leachate cause soil pollution such as changes in the physical and chemical properties of soil, effects on the activity of soil microorganisms, and accumulation of toxic substances in the soil(Asia Company Limited for the PRC Ministry of Housing et al., 2018).Sabai et al. (2016) reiterated that dumping of C&D waste puts pressure for the acquisition of large tracts of land to enable disposal of the increasing waste generated by construction and demolition sites. Others include imposed economic burdens, social discomfort as well as sources of environmental pollution like air and water pollutants.

III. Method

This research focused on the evaluation of the building industry’s professional attitude toward construction and demolition waste disposal with a view to mitigating environmental hazards. A random sampling technique was used in the selection of 180 building industry professionals (BIP) respondents among whom were Architects, Engineers, Quantity Surveyors, and Builder

IV. Results and findings

In line with set objective one assessing the BIPs demographic characteristics in the study area it was discovered that out 180 respondents, 60no are Architects representing 33.3% of the total population of study while Builders were 15no representing 8.3%,Engineers who responded were 57no 31.7% and Quantity Surveyor were 45 in number amounting to 25.0%while other professionals on site were 3no representing 1.7%. Further to this a survey of the BIPs years of experience was taken into consideration to ascertain effect of experience years on attitude to waste and environmental hazards. Result showed that majority of the respondents falls between 6-20years of experience with 6-10years 20%(36no),11-15years 36.1%(65no) and 16-20years 23.9%(43no) while the minority are below 5years,21-25years and 26-Above representing 8.9%, 5.6%and 5.6% respectively.

Table1 showing BIPs demographic characteristics of the respondents

Profession	Frequency	Percentage
Architect	60	33.3
Builder	15	8.3
Engineer	57	31.7
Quantity Surveyor	45	25.0
Others	3	1.7
Total	180	100.0
Years of experience		
Below-5	16	8.9
6-10	36	20.0
11-15	65	36.1
16-20	43	23.9
21-25	10	5.6
26-above	10	5.6
Total	180	100.0
Projects Undertaken		
Residential apartments	114	63.3
Structural work	25	13.9
Commercial buildings	10	5.6
Academic buildings	11	6.1
Civil works	10	5.6
Retrofitting	5	2.8
Others	5	2.8
Total	180	100.0

Several projects were done by the respondents ranging from Residential apartments to Structural steel work, Commercial buildings to Academic buildings while others worked on Civil works and Retrofitting among others.

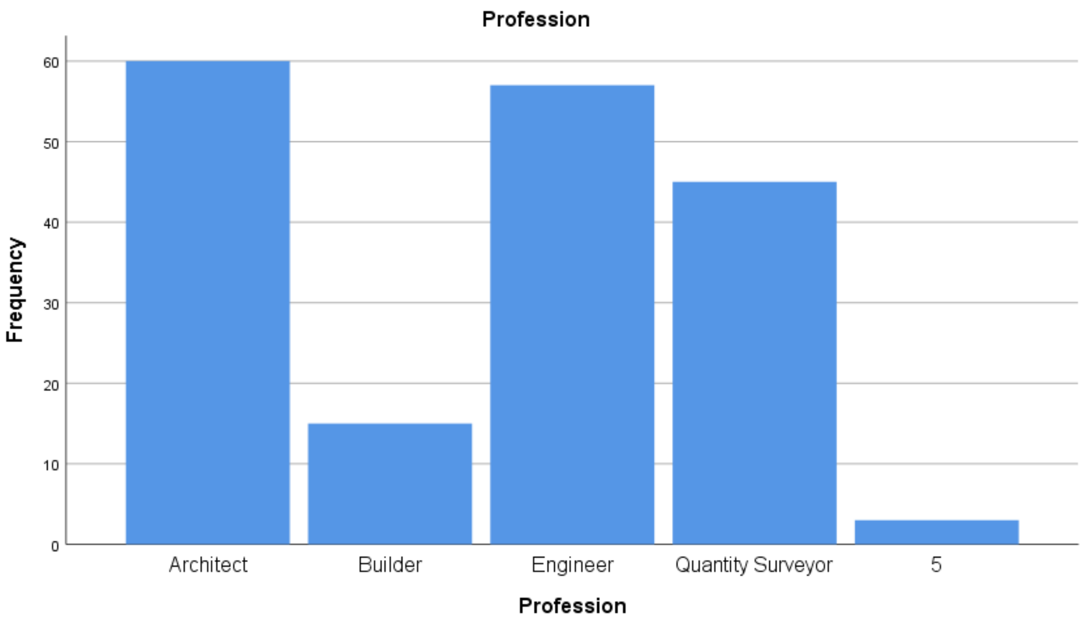

Figure 1 showing professionals that responses to the survey in the study area.

Table 1 and Figure 1 respectively shows that 57 engineers that represent 31.5% of the 180 respondents. From these 57, 19.3% believed that it is the responsibility of the engineers to take care of construction and demolition waste. This accretion is further supported by Table 2 that shows a significant level of 0.011 from the Anova table when the regression of profession as a dependent variable and year of experience independent variable

Table 2: *Regression ANOVA[a]*

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.777	1	9.777	6.616	.011[b]
	Residual	263.023	178	1.478		
	Total	272.800	179			

a. Dependent Variable: Profession
a. Predictors: (Constant), Years of experience

ii. From the second objective examining BIPs involvement in C & D waste management, result showed that the majority (63.3%) are partially involved in waste management while 36.7% are not involved in waste management. This was further investigated to determine which of the Professionals are more involved than the other and this will indicate which of the BIPs is conscious of environment hazards as shown in Table 3.

Table 3: Showing all BIPs level of Involvement in C & D waste management

	Frequency	Percent		Cumulative Percent
Partially involved	114	63.3		63.3
Not involved	66	36.7		100.0
Total	180	100.0		

There are 114 responses on the question of how involved the BIPs are in C& D waste management as partially involved while 66 respondents are not involved at all. Furthermore Table 4 shows BIP that believes that they have a degree of function in C&D waste management.

Table 4: *BIPs Involvement in C&D waste management*

Architects Involvement

	Frequency	Percentages
Partially involved	30	50.0
Not involved	30	50.0
Total	60	100.0
Builders Involvement		
Partially involved	11	73.3
Not involved	4	26.7
Total	15	100.0
Engineers Involvement		
Partially involved	32	56.1
Not involved	25	43.9
Total	57	100.0

Table 5: *Regression ANOVA[a]*

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.133	1	1.133	4.597	.033[b]
	Residual	43.867	178	.246		
	Total	45.000	179			

a. Dependent Variable: Involvement in waste management

b. Predictors: (Constant), Are your sites properly planned for effective waste management?

From table 5, it shows the significant level of 0.33 which means than the BIPs have their site well planned for effective C & D waste management in spite of the result of not been involved in C&D waste disposal.It is therefore necessary to say that when BIPs are not fully involved in C&D waste disposal and monitoring, C&D waste will be disposed indiscriminately and it constitute hazards to the environment. Result shows that the site is effectively planned to forestall other forms of hazards but no careful plan for environmental hazards.

V. Conclusion/ Recommendation

It is therefore concluded that the bulk waste from construction and demolition activities should be given proper attention by all BIPs with increase in awareness. Continuous enlightenment should be carried out among all professionals in the building industry for a more sustainable environment. Therefore it is recommended that constanteducation should be carried out among all stake holders in the built environment to mitigate against construction and demolition waste hazards on the environment while government should provide incentives for proper C & D waste management among the construction professionals.

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