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APPRAISAL OF BARRIERS TO SUSTAINABLE MANAGEMENT OF CONSTRUCTION AND DEMOLITION WASTE IN NIGERIA

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Abstract

Effective management of Construction and demolition waste (C&DW) is a critical aspect of sustainable development which is receiving attention from policymakers and researchers globally. Managing construction and demolition waste in Nigeria presents multifaceted challenges that require tactical interventions to mitigate adverse environmental impacts and promote sustainable practices. This paper explores the barriers hindering the sustainable management of construction and demolition waste (C&DW) in Nigeria using Edo state as the research area for the study. The data used in this study were collected from both primary and secondary sources. The primary data were collected through survey questionnaires distributed to targeted respondents comprising of contractors, Builders, Engineers, Architects, Quantity surveyors in the study area, while the secondary data were collected via the review of related literature. Out of the 65 questionnaires distributed, only 55 valid forms were retrieved. The collected data accounted for 85% of the entire survey and were suitable for the analysis. Analysis was carried out using descriptive statistical tools. Findings from the study revealed that lack of waste segregation/treatment and recycling facilities, policy, legislation, regulation, funding and education leaves stakeholders with no option but to use their initiatives in dealing with Construction and demolition waste (C &DW) by employing unsustainable approaches like open dumping, burning, and landfilling. Construction and demolition waste management requires substantial investments in infrastructure, human resources and technology. Conclusively, the study recommended the need for a multi-faceted approach that combines regulatory enforcement, public education, and technological innovation including concerted efforts from government and stakeholders to address the issue of construction and demolition waste management.

Keywords: Construction and demolition waste (C&DW), Construction and demolition waste management (C&DWM), Construction industry.

1.0 Introduction

Nigeria is witnessing a lot of environmental issues that are slowly becoming a threat to humans, animals and the environment. Among such adverse problems, construction and demolition waste is a growing concern not only to Nigeria, but globally (Ogunmakinde et. al., 2019 and Olofinnade et al., 2020). The Nigerian construction industry is affected by the continuous generation of waste and poor waste management (Akinradewo et. al., 2020; Aboginije et. al., 2021). This is as a result of a rapid growth phase, with new buildings, roads, and infrastructure projects springing up across the country. With the upsurge of construction and demolition works due to rapid urbanisation and industrialisation there is likely to be tremendous increase in the generation of C&D waste (Olofinnade et al, 2020; Tongo& Salisu, 2023 and Santos et al, 2023).

Waste generation rates has been triggered to an unprecedented level that its management has become a challenge (Ogunseye et al, 2023). An increase in waste generation at the construction sites in the Lagos metropolis was reported, which calls for an urgent need to manage the waste to avert environmental hazards. The construction industry in Nigeria generates a significant amount of waste,

which if left unaddressed, can result in environmental degradation and resource depletion. The proper management of C&DW is a challenge in many countries, particularly developing countries (Al-otaibi et. al., 2022). Construction and demolition waste management is a global issue and most especially a very serious issue for developing countries who lack the requisite knowledge and wherewithal.

The Nigerian construction industry is affected by the continuous generation of waste and poor waste management (Akinradewo et. al., 2020; Aboginije et. al., 2021). Aboginije et. al., 2021 in a recent study assessed the current waste management strategies implemented in Nigerian construction projects by construction professionals in the Lagos metropolis and their findings showed that waste management strategies employed were "not sustainable enough". Ogunseye et al, 2023 opined that developed countries have made considerable advancements in construction and demolition waste management (C&DWM) while developing countries are still lagging. Nigeria is confronted with waste management problem. While it is obvious that concerted efforts are being made to tackle waste problem, little has been achieved regarding C&DWM. The ineffective and inefficient management of construction and demolition waste globally and especially in a developing country like in Nigeria, is fast becoming worrisome and alarming (Tongo& Salisu, 2023). Despite the fact that developing Countries are beginning to employ waste management practices, the system is fraught with inefficient collection and inappropriate disposal of waste in the industry as a vast amount of waste is dumped in river banks, open spaces and roadsides. The inefficient disposal of such waste not only exacerbates environmental degradation but also poses health risks to the population. This has resulted in health and other environmental impacts in addition to negative economic impacts.

There are prior studies on sustainable construction and demolition waste management (C&DWM) in developed and some other developing countries among these is the research carried out by Ogunseye et. al. (2023) on C&DWM in Nigeria. It was also observed that research on C&DWM has not been nationwide in outlook with studies extended to different states or geopolitical zones in Nigeria to inform a comprehensive policy on sustainable C&DWM.

Thus, there is need to assess the barriers to efficient construction and demolition waste management in Nigeria, using Edo state as the research area in order to propose strategies to enhance sustainable waste management practices in Nigeria with a view to improve citizens' quality of life and eliminate environmental nuisances caused by C&DW, and effectively implement various strategies and policies on construction and demolition waste management practices. Effectively, the identifications of these barriers may help all stakeholders and decision makers to develop the strategies required to mitigate them. Conclusively, it is pertinent to effectively tackle the hurdles to achieving sustainable C&D waste management and develop sustainable, secure, and resilient urban settlements in line with SDG 11 of the United Nations' Sustainable Development Goals (SDGs) (United Nations, 2015).

2.0 Literature Review

2.1 Construction and Demolition waste management in Nigeria

The construction industry encompasses the design, construction, maintenance, and demolition of assets, buildings, engineering, and infrastructure works (Al-otaibi et. al., 2022). However, the construction, maintenance and demolition of these infrastructure works generate a huge amount of construction and demolition waste(C&DW). C&DW is defined as solid waste, which is produced within construction activities, particularly, the waste that stems from the processes of construction, renovation/retrofitting and demolition (Abdelhamid, 2014; Ghafourian et. al., 2016; Park and Tucker, 2017; Aboginije et al, 2021 & Santos, et. al. 2023) C& DW consists of inert, non-inert, non-hazardous waste and hazardous waste materials such as sand, gravel, timber, roofing sheets, concrete, plaster, wood, metal, broken tiles and masonry etc. (Meckwan & Patel 2019 & Kabirifar et al, 2020).

A huge amount of construction and demolition waste is produced in Nigeria annually due to increased population growth, urbanisation and rapid industrialisation. About 60-70% of CDW materials are

either reused, recycled, or resold, while the residual waste is indiscriminately disposed of by open dumping in river banks, roadsides, and many other open spaces, landfilling, burning, and reuse (Olofinnade et al, 2020). Unfortunately, very little material is recycled, leaving vast quantities to be dumped in landfills and other unapproved locations across the nation. Tongo& Salisu, 2023 in their findings attributed major urban crises such as water and marine contamination, soil and air pollution, blockage of city drains, disease spread including cholera, malaria, and other vector-borne diseases, unpredictable travel times and congestion, fire outbreak, flooding, and other related environmental challenges on poor construction and demolition waste management practices in Lagos. Sadly, most traditional approach to managing C&D waste in Nigeria is considered to be unsustainable as it lacks flexibility and long-term reliability.

Developing countries are beginning to engage in waste management practices, but still, there is a culture of insufficient collection and improper disposal. In Nigeria, the management of construction and demolition waste poses several challenges that hinder effective waste management practices in the country. Studies (Jin et. al., 2017;Faruqui &Siddiqui, 2020; Olofinnade et al 2020, Al-Otaibi et al, 2022 & Ogunseye et al 2023) have shown that lack of policy, legislation and weak enforcement of environmental regulation leaves stakeholders with no option but to use their initiatives in dealing with the C&DW leading most construction firms and contractors to employ unsustainable approaches like open dumping, burning, and landfilling even though there are sustainable C&DWM practices of reusing, recycling, and composting. The absence of stringent government regulations and enforcement mechanisms is also a significant challenge in the management of construction and demolition waste in Nigeria. Without clear guidelines and penalties for non-compliance, proper waste management practices are neglected, prioritizing cost-cutting measures over environmental conservation. This lax regulatory environment perpetuates the cycle of waste mismanagement in the country.

Another challenge is the fundamental data on C&DW that will inform effective planning for sustainable C&DWM which is absent in many developing countries including Nigeria. (Faruqui &Siddiqui, 2020; Correia et.al,2021). Furthermore, insufficient funding for waste management projects is another challenge faced in Nigeria. (Islam et. al., 2024; Lockrey et. al. 2016; Chen et. al., 2019 & Negash et. al, 2021). Adequate funding is crucial to develop and implement sustainable waste management solutions, including recycling facilities and improved disposal methods. The government and investors need to allocate more resources to address this issue effectively. Additionally, the limited awareness and education among construction stakeholders about the importance of proper waste management further exacerbate the situation (Yuan, 2013; Ogunseye et al 2023 & Lockrey et al. 2016). Lastly, lack of knowledge, expertise and technology has been reported as barriers hindering sustainable C&DWM (Negash et. al, 2021).

Conclusively, if appropriate measures are not taken to manage construction waste sustainably, the problem will worsen. The construction industry in Nigeria generates a significant amount of waste, which if left unaddressed, can result in environmental degradation and resource depletion. Increased population growth and improved living standards continue to exacerbate the threat posed by construction industry material waste (Ferronato and Torretta 2019). The authors stressed the need for urgent improvement in construction waste management practices. In order for C&D waste management's goals to be achieved, significant barriers hindering its implementation need to be recognized and considered.

3.0 Research Methodology

The study explored the challenges of efficient construction and demolition waste management in Edo state. This study adopted a survey research design and both primary and secondary sources of data were used in this study. The primary data involved the use of a questionnaire survey administered to contractors and other construction professionals within Edo state, while the secondary data, sourced

published documents such as, journal articles, newspaper articles, etc., was used to build up the literature review and the research gap. A non-probability sampling procedure was adopted in this study. A snowball sampling technique was used to administer 65 copies of questionnaires to contractors, builders, Architects, Quantity surveyors and civil Engineers practicing and actively engaged with construction and demolition projects within selected construction sites in Edo state.

The sample was selected using non-probability sampling techniques which consist of purposive and snowball sampling technique was based on the peculiarity of the unavailability of population data for contractors within the study area. A total of 55 copies of questionnaire administered to the contractors and other construction professionals were completed, retrieved and used for analysis. The questionnaire designed for the study consisted of close-ended questions comprising of two sections: the first section contained demographic questions where respondents had to choose and answer from the alternatives provided while the second section was designed to assess the challenges of efficient construction and demolition waste management in Edo state. In order to achieve the objectives of the study, 5-point Likert scale was used to inquire information from respondents where 1= strongly disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= strongly agree. The Likert scale was transformed to Mean Item Score (MIS) and Standard Deviation (SD) for each of the identified variables. Methods of data analysis adopted for the study includes percentages and mean item score (MIS)

4.0 Findings and Discussion

4.1 Background Information

The demographic information of the respondents indicates that majority of the respondents worked in both public consulting and contracting firms, followed by private organisation firms, whereas government establishments had the lowest number of respondents. In addition, their educational qualification and years of experiences indicated that their opinion can be relied upon and can be valid with regards to the questions and objectives of this study Also, 60% of the respondents have worked for a period of 0-5years while 30% have 6-10years working experience and lastly 8% and 2% have worked between 11- 15years and more than 15years respectively. Furthermore, there was an almost even distribution of the professionals (i.e. civil engineers, builders, quantity surveyors, contractors, and architects) to ensure there was no form of bias with any of the professionals making up the larger percentage of the sample population.

4.2 The barriers to efficient construction and demolition waste Management in Edo state.

Table 1 below reveals the barriers to efficient C&DWM. The highest barrier to sustainable C&DWM with a mean item score of 4.71 is lack of waste segregation infrastructure. This is closely followed by Inadequate Government policies and regulation which ranked second and third with mean item scores of 4.48 and 4.38 respectively. Others are Inadequate public awareness and education, insufficient funding for waste management projects, inefficient collection systems/ illegal dumping, insufficient recycling facilities with mean scores of 4.37, 4.33, 4.22 and 4.21 respectively with the last two barriers which are limited research innovation and limited public participation with mean item scores of 3.98 and 3. 82.

Table 1: Barriers to efficient construction and demolition waste Management in Edo state

Identified Barriers	MIS	Rank
Lack of adequate waste segregation infrastructure	4.71	1
Inadequate Government policies	4.48	2
Poor enforcement of regulations	4.38	3
Insufficient funding for waste management projects	4.37	4
Inefficient collection systems/ illegal dumping	4.33	5
Insufficient recycling facilities	4.22	6
Lack of sustainable waste management plan	4.21	7
Lack of data management systems	4.19	8
Inadequate training and capacity building/ Shortage of skilled manpower	4.18	9
Limited stakeholder collaboration and engagement	4.17	10
Inadequate monitoring and evaluation	4.08	11
Cultural attitudes towards waste	3.98	12
Limited research and innovation	3.96	13
Limited public participation	3.82	14

Table 2: Strategies to mitigate barriers to efficient construction and demolition waste Management in Edo state

Identified Strategies	Mean	Rank
Implementing waste segregation at the source	4.86	1
Encouraging reuse and recycling of materials	4.75	2
Enforcing strict regulations and policies on waste disposal	4.68	3
Investing in Waste management infrastructure	4.65	4
Promoting public awareness and education	4.62	5
Collaborating with stakeholders in the waste management sector	4.48	6
Establishing Public Private- Partnerships	4.24	7
Encouraging innovations in waste management technologies	4.18	8
Incentivising sustainable waste management practices	3.92	9
Implementing incentive programmes for waste reduction	3.86	10
Conducting regular monitoring of waste management practices	3.72	11

4.3: Strategies to mitigate barriers to efficient construction and demolition waste Management in Edo state

Table 2 reveals the strategies to mitigate barriers to C&DWM. The first being Implementation of waste segregation at the source with a mean item score of 4.86, followed by encouraging reuse and recycling of materials, enforcing strict regulations and policies on waste disposal, investing in Waste management infrastructure with mean item scores of 4.75, 4.68 and 4.65 respectively with the last being conducting regular monitoring of waste management practices.

4.4 Discussion

Findings from the study revealed that lack of proper infrastructure is one of the major challenges facing construction and demolition waste management in Nigeria. The country lacks adequate facilities for segregation, recycling and processing of construction and demolition waste, leading to the indiscriminate dumping of waste in landfills and open spaces. The lack of strict government regulations and enforcement mechanisms to ensure compliance with waste management policies results in poor waste management practices and hinders efforts to reduce the environmental impact of construction and demolition activities. This corroborates the findings of Benshak et al., 2021, Olofinnade et al.

2020, Al-Otaibi et al, 2022 and Ogunseye et al. 2023 which opines that lack of policy, legislation and regulation leaves stakeholders with no option but to use their initiatives in dealing with the CDW leading most construction firms and contractors to employ unsustainable approaches like open dumping, burning, and landfilling even though there are sustainable CDWM practices of reusing, recycling, and composting.

Limited awareness and education among stakeholders, including construction firms/ contractors, demolition crews, and the general public, is also a major challenge. Many people involved in the construction industry are not aware of the importance of proper waste management practices or the negative impact of improper disposal of construction and demolition waste. There is low level of awareness regarding the negative impacts of CDW on public health and the environment. This in consonance with the submission of Ogunseye et al 2023 which attributes the low level of education as the reason for inefficient CDW management. Poor or improper waste segregation practices contribute to the challenges facing construction and demolition waste management in Nigeria. Without proper segregation of waste at the source, it becomes difficult to recycle and recover valuable materials from the waste stream. The study of Oluwasegun & Vsevolod (2023) corroborates this view and stressed the importance of waste sorting at the source of generation.

Insufficient funding for waste management infrastructure and operations is another challenge. The lack of financial resources hinders the development of recycling facilities, waste treatment plants, and other essential infrastructure for managing construction and demolition waste effectively. This constraint poses a significant challenge to the implementation of sustainable waste management projects in Nigeria. Construction and demolition waste management require substantial investments in infrastructure, technology, and human resources. However, the limited financial resources allocated to waste management initiatives hinder the development of efficient and effective solutions to address the growing waste problem in the country. This aligns with the submission of Olofinnade et al 2020 and Al-Otaibi et al, 2022 which attributed financial constraint as a barrier to sustainable C&DWM.

The absence of advanced technological solutions for waste management is a significant challenge in Nigeria. The country lacks modern waste processing technologies and equipment, which could help improve recycling rates and reduce the environmental impact of construction and demolition activities. This stance is in affirmation of the findings of Islam et al, 2024 asserting that there is limited utilisation of information technology e.g. GPS for C&D waste tracking. Limited research and data on construction and demolition waste management hinders efforts to develop sustainable solutions. Without accurate information on waste generation rates, composition, and disposal practices, it is challenging to implement effective waste management strategies.

5.0 Conclusion and Recommendations

Construction and demolition waste management in Nigeria poses significant challenges due to rapid urbanization and infrastructure development. As the construction industry continues to grow, the need for effective waste management strategies becomes increasingly critical. Proper waste segregation at the source is crucial for effective management of construction and demolition waste. By separating materials such as concrete, wood, and metal, recycling and reuse become more feasible, reducing the overall waste volume .More so, promoting the reuse and recycling of construction and demolition waste materials can significantly reduce the amount of waste going to landfill and encouraging the use of recycled materials in new construction projects can also help conserve natural resources.

To mitigate the barriers identified, the following recommendations are proposed:

1. Strict enforcement of waste management regulations and policies is essential to ensure compliance and accountability within the construction industry. Penalties should be imposed on violators to deter illegal dumping and promote responsible waste disposal practices. Most importantly, the need for proper waste management infrastructure, such as recycling facilities

and waste treatment plants, cannot be overstated. Investing in these facilities will help streamline the waste management process and facilitate the recycling and disposal of construction and demolition waste.

2. Community outreach programs and awareness campaigns can help change attitudes towards waste disposal and encourage responsible behaviour. Collaboration between various stakeholders, including government agencies, construction companies, waste management authorities, and local communities, is essential for developing comprehensive waste management solutions. By working together, stakeholders can share resources and expertise to address the challenges effectively.
3. Incentivizing Sustainable Practices by offering incentives for businesses and individuals that adopt sustainable waste management practices can help drive positive change. Tax breaks, subsidies, and grants can motivate stakeholders to prioritize waste reduction, reuse, and recycling efforts.
4. Establishing public-private partnerships can enhance the capacity and resources available for waste management initiatives. Public-private collaborations can lead to innovative solutions and shared responsibilities for managing construction and demolition waste.
5. Implementing or embracing green building practices, such as sustainable design, energy efficiency, and waste reduction, can help minimize the environmental impact of construction projects. By incorporating green building principles, developers can reduce waste generation and promote a more sustainable construction industry.

Conclusively, effective construction and demolition waste management in Nigeria require a multifaceted approach that addresses the challenges faced by the industry. By implementing effective strategies, stakeholders can work towards a more sustainable and responsible waste management system. It is essential to prioritize collaboration, innovation, and regulatory enforcement to overcome the challenges and create a cleaner, healthier environment for future generations. By following these strategies, Nigeria can begin to tackle the challenges facing construction and demolition waste management effectively. With a concerted effort from all stakeholders, a sustainable waste management system can be established, ensuring a cleaner and greener future for the country.

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