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CIRCULAR ECONOMY APPROACHES TO DECONSTRUCTION IN NIGERIA: BARRIERS AND STRATEGIES FOR RESOURCE EFFICIENCY

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Abstract. The construction industry produces a lot of waste because of its traditional demolition practices and poor management of construction materials. This study examined the circular economy methods of deconstruction in the Nigerian construction industry so as to determine the present practices, barriers, and strategies for improving resource efficiency. Quantitative research design was used to collect data through questionnaires that were administered to construction practitioners such as architects, civil engineers, quantity surveyors, contractors, and project managers. The analysis of data was done using descriptive statistics like frequency distribution, percentage analysis, mean score, and ranking. Findings show that partial deconstruction is more common than full deconstruction, although demolition is the most widely used. The most commonly recycled materials are steel, timber, and concrete. The study also showed that respondents have high awareness of circular economy, as construction professionals mostly believe that deconstruction improves resource efficiency. However, there are numerous barriers that prevent implementation, which include lack of awareness, high costs, shortage of time, lack of skilled labour, inadequate recycling facilities, and weak policy support. This study discovered that policy and regulation, training and awareness, materials sorting on site, and improved recycling infrastructure are the most important strategies for improving deconstruction practice in Nigeria. It is concluded that for effective circular economy to be adopted in the Nigerian construction industry, there must be coordinated efforts involving government support, professional training, infrastructure development, and stronger sustainability policies.

Keywords: Circular Economy, Construction Waste, Deconstruction, Resource Efficiency, Sustainable Construction

1. Introduction

1.1. *The Problem of Construction Waste*

Construction uses a huge amount of world's resource and produces a lot of wastes, thereby contributing substantially to the global production of solid waste and causing environmental pollution. As reported by the World Bank (2018), construction and demolition (C&D) waste make up one of the largest waste categories across the globe, with growing concern regarding the environmental implications as well as wasteful nature of the process. Rapid urbanization and development in developing countries like Nigeria have resulted in even higher material demand and production of waste.

1.2. *Deconstruction as an Alternative*

Traditionally, demolition has been considered to be the primary way to clearing buildings from the land. The process destroys structures fast, with little consideration about recovering material. Deconstruction is a more sustainable approach involving disassembly of buildings in order to preserve and reuse as much material as possible and can be viewed as an example of circular economy (Kibert, 2016).

Deconstruction could be viewed as a tangible method to lessen the construction and demolition (C&D) waste generation and promoting material recycling and reuse. According to Kibert (2016), deconstruction involves the careful dismantling of building components so they can be recycled. Similarly, Guy & Ciarimboli (2006) noted that by diverting waste materials from landfills and extending the lifespan of building components, deconstruction promotes environmental sustainability. Nevertheless, deconstruction is unpopular. Ofori (2015) found that many low-income countries still rely on conventional demolition methods because of time constraints and a lack of technology.

1.3. *Circular Economy in the Construction Industry*

The concept of circular economy is the reduction of wastage by reusing and recycling resources. According to Ellen MacArthur Foundation report Towards the Circular Economy: Economic and Business Rationale for an Accelerated Transition (2013), a shift from the existing linear process of 'take-make-dispose' to a circular system can lead to improved sustainable construction outcomes. In the construction industry, this refers to designing buildings in such a way that makes it possible to recover, reuse, and recycle materials at the end of their life cycle.

The idea of circular economy encourages the transition from the conventional "take-make-dispose" linear economy to an economy focused on efficient utilization and reduced waste. According to the Ellen MacArthur Foundation report Towards the Circular Economy: Economic and Business Rationale for an Accelerated Transition (2013), circular economy can be defined as an economic model that attempts to maximize the utilization of materials by means of reuse, recycling, and regeneration.

In the construction industry, some of the activities under circular economy include designing with disassembly in mind, reuse of materials, and recycling. According to Adams et al. (2017), there has been growing awareness about circular economy in the construction industry, but its application has been minimal, particularly in developing nations. Ubayi (2025) and Unegbu et al. (2025) also noted that although Nigerian construction practitioners are becoming more aware of the concepts of the circular economy, the application is still quite limited. Similarly, Heisel et al. (2025) found that the adoption of deconstruction practices remains limited despite growing awareness of circular economy principles. The construction industry may be able to transition from awareness to practice and promote a more sustainable built environment by closing this awareness practice gap.

1.4. *Design for Disassembly*

An important concept associated with circular economy in the construction industry is Design for Disassembly (DfD). This means designing buildings and building elements in such a way that they are easily disassembled, recycled, and reused at the end of their lifecycle. The DfD approach promotes efficiency and decreases construction waste.

1.5. *Barriers to Adoption*

Deconstruction and other concepts of circular economy are highly beneficial to sustainable development. However, deconstruction practices have not yet gained enough popularity among architects and contractors in Nigeria. Researchers point out that there are quite a lot of problems related to material waste production, poor implementation of deconstruction policies, and low rates of material recycling in developing countries (Ofori, 2015; Windapo & Goulding, 2015).

Numerous studies have identified the barriers that hinder the adoption of deconstruction and the circular economy. Akinade et al. (2015) found that the main barriers were the high cost of initiation, unavailability of manpower, and lack of technological support. Similarly, Adams et al. (2017) stated that inadequate policies and infrastructure hinder the adoption of circular economy approaches. Moreover, Windapo and Goulding (2015) stressed that there is a theory-practice gap in the construction industry, especially in developing countries. Lack of awareness, weak regulation enforcement, and lack of motivation for sustainable practices were cited as reasons for the gap.

1.6. *Material Recovery and Resource Efficiency*

Material recovery is another essential part of sustainability in construction and circular economy principles. According to Ding (2014), proper construction wastes management requires reduction, reuse, and recovery of materials in order to reduce environmental effects. Materials including steel and timber are often preferred for recycling because of their economic and recycling benefits. However, Osmani et al. (2008) argue that construction wastes have always been a problem because of ineffective management and failure of recycling techniques. For instance, reusable materials are often not well separated for reuse purposes.

Although deconstruction remains relatively uncommon in Nigeria, informal processes of material recovery are becoming increasingly accepted for their role in resource recovery in developing countries. Nigeria has informal waste sectors that make a lot of contributions to material recovery (European Commission, 2026). It is therefore clear that material recovery in Nigeria is happening independent of formal construction processes. Hence, there is the need to consider both formal and informal recovery practices when assessing circular economy implementation.

1.7. *Strategies for Improving Resource Efficiency*

Researchers have recommended a number of strategies to encourage the application of circular economy in the construction industry. These include developing favorable policies and legislation, setting up recycling facilities, and capacity building by educating and training individuals (Ding, 2014; Akinade et al., 2015). Achieving efficiency will depend on how construction materials are sorted and how recycled resources are used. The governments, construction companies, and academic institutions are among different stakeholders that must to work together to implement these policies. Legislators and business must work together to close these systematic gaps, combining well-thought-out incentives with sincere investments in recycling infrastructure to put awareness into practice (Bello, 2025; Ubayi, 2025).

1.8. *Research Gap*

Although previous studies have examined construction waste management and circular economy awareness in developing countries, there is scarcity of studies specifically on deconstruction practices, material recovery, and resource efficiency strategies in the Nigerian construction industry. Moreover, few studies have been carried out to investigate the practical barriers affecting the implementation of circular economy principles in deconstruction activities. This study therefore aims to fill this gap by collecting field data from construction professionals across six Nigerian cities, with the objective of understanding what actually happens on the ground and what may help to move the industry forward.

2. Materials and Method

For the purpose of this study, quantitative survey research was used to examine circular economy strategies to aid deconstruction in Nigeria. This method is deemed appropriate because it enables the systematic collection of structured data, as well as the use of statistical analysis to understand current practices, challenges, and areas requiring improvement. The use of survey

questionnaires continues to be common in construction management research because they enable the collection of standardized data from multiple respondents within a short period of time and support quantitative analysis of professional opinions and practices (Creswell, 2014; Naoum, 2013).

The target population consists of construction professionals working in Nigeria, especially those engaged in the construction of buildings, their demolition, and management of construction projects. These include civil engineers, architects, quantity surveyors, contractors, and project managers. These professionals have been chosen due to their participation in decision-making process with respect to construction, handling of construction materials, and sustainability practices.

A structured questionnaire that was developed based on a survey of the literature on circular economy and deconstruction methods was used to collect primary data. Naoum (2013) stated that questionnaires are a useful tool for collecting standardised data from a sizable sample in a short amount of time. This study questionnaire was designed to include important elements of the research like respondents' background, current deconstruction practices, material waste and resource efficiency, awareness of circular economy concepts, obstacles to deconstruction and reuse, and strategies to improve these processes. The questionnaire contained multiple choice questions, yes/no questions, and a five-point Likert scale items (that ranged from "strongly disagree" to "strongly agree").

In order to select the most appropriate respondents, a purposive sampling technique was used in the research. This method guarantees that data is provided by individuals who have sufficient knowledge and experience in construction and demolition processes. The sample size was determined based on the availability of qualified respondents within the study area. Purposive sampling has proven to be a widely accepted technique used in construction management research when the opinion of experts is needed to provide valid conclusions (Ofori, 2015).

The questionnaires were distributed to construction professionals working in six major Nigerian cities, which include Lagos, Abuja, Port Harcourt, Kano, Yola, and Kaduna. This reflects a representation of construction practices from the different geopolitical zones. A total of 150 questionnaires were distributed, out of which 67 were returned. Eight were discarded due to incomplete responses, yielding 59 valid responses, representing a valid response rate of 39.3%. The response rate is comparable to recent construction management studies in West Africa, including Pittri et al. (2025) at 41.2% and Unegbu et al. (2025) at 37.8%, and exceeds the 20 – 30% range commonly reported for busy construction professionals (Akintoye, 2000). The sample size was determined by practical feasibility and comparison with similar studies (Unegbu et al., 2025 distributed 200 questionnaires; Ubayi, 2025 distributed 180) and noting that busy construction professionals typically yield response rates of 20-30% (Akintoye, 2000).

The data were analysed using the descriptive statistics such as frequency distribution, percentage analysis, and mean score ranking. Frequency and percentage analysis was used to demonstrate both profiles and responses of the respondents. The barriers and strategies that were identified using the Likert scale values were ranked using the mean scores method. The mean score technique has been used extensively in construction studies to establish priority factors influencing projects and decisions (Akintoye, 2000). The mean score was obtained by multiplying the frequency of each response with its weight and then dividing the sum by the total number of responses. The findings were then summarized in tables to aid in clear presentation and comparison of the results.

For the validity of the instrument, the researcher designed questions from the existing literature on circular economy and sustainable construction. Validity was also assessed through the views of construction management experts who evaluated the suitability of the questions with respect to the research objectives. Reliability of the instrument was determined using Cronbach’s

Alpha. According to Cronbach (1951), the minimum acceptable reliability value should be 0.70. The reliability of this questionnaire was 0.84, indicating high levels of reliability and internal consistency. Some implications of the results can be derived but several limitations should be highlighted. The sample size of 59 respondents, makes it small compared to other similar studies that were carried out in Nigeria recently. The use of purposive sampling and descriptive statistics also makes the results less generalizable than when probability sampling and statistical analysis methods are used. It should however be noted that most of the participants have experience in deconstruction and construction waste management. This implies that their views are meaningful and informed.

Finally, the study adhered strictly to ethical guidelines. Respondents voluntarily participated in the survey and the collected data was made anonymous. All privacy concerns were addressed.

3. Results and Discussion

Results from this study offer vital information about the current state of deconstruction and circular economy activities in Nigeria and support several pieces of literature available on this subject.

3.1 Demographics of respondents

Table 1 represents the profile of the respondents. Most of the respondents were civil engineers (35.60%), followed by contractors (22.03%), and quantity surveyors (15.25%). Architects and project managers formed smaller percentage of the respondents. This implies that the collected data is provided by professionals who are directly involved on site and in the management of materials. Hence, the responses provide useful professional views on deconstruction practices in Nigeria. However, the findings may not be generalisable due to the small sample size.

Table 1. Respondents Demographics

Variable	Category	Frequency (n)	Percentage (%)
Profession	Architect	7	11.86
	Civil engineer	21	35.60
	Quantity Surveyor	9	15.25
	Contractor	13	22.03
	Project Manager	5	8.47
	Other	4	6.78
Years of experience			
	0 to 5 years	8	13.56
	6 to 10 years	15	25.42
	11 to 15 years	16	27.12
	Above 15 years	20	33.90
Organization type			
	Consulting firm	8	13.56
	Construction company	17	28.81
	Government	18	30.51
	Academic	14	27.73
	Others	2	3.39

Most of respondents had more than 10 years of experience, out of which 33.90% had more than 15 years and 27.12% had 11–15 years. It means that the responses are provided based on knowledge from industry experience. This increases the practical value of the responses.

Regarding the type of organizations, most of respondents were from the government sector (30.51%) and construction companies (28.81%), followed by academia and consulting firms. This shows a good mix of views from policy, practice, and research.

3.2 Current Deconstruction Practices

From the results presented in Table 2, it can be seen that partial deconstruction (45.76%) is the most common practice, then demolition (35.60%), and full deconstruction (18.64%). This implies that the construction industry relies on conventional demolition methods. Although some materials may be recovered in the process, principles of a circular economy are not fully adopted. This finding is consistent with the statement of Ofori (2015) that developing countries are restricted by cost and time thus they prefer conventional demolition methods.

This pattern is not peculiar to only Nigeria for similar findings have been reported in other developing countries in previous studies. In Nigeria, Ubayi (2025) and Unegbu et al. (2025) attributed these problems to the lack of appropriate recycling facilities and technologies. Also, there may be some informal material recovery and reuse that has not been accounted for.

Table 2. Current deconstruction practices

Variable	Option	Frequency	Percentage (%)
Method used	Demolition	21	35.60
	Partial deconstruction	27	45.76
	Full deconstruction	11	18.64
Material separation	Yes	30	50.85
	No	11	18.64
	Sometimes	18	30.51

Regarding material separation, 50.85% practice material separation, while the rest do not or rarely practice it.

Since respondents were allowed to select multiple options, the total frequency was more than the number of respondents. The percentages were therefore calculated based on the total number of respondents.

3.3 Material Recovery

Figure 1 illustrates the results of materials that are recovered at the end of the structure's life cycle. The most commonly recovered material is steel (64.40%), then timber (35.60%) and concrete (28.81%). A very low percentage of Bricks/Blocks materials recycled. The high recovery of steel could be due to its economic value and its possibility to be reused. This is consistent with the findings of Ding (2014) who identified steel as a high-value material with a strong potential for reuse. Bricks and concrete are not usually recycled due to the lack of recycling facilities or poor recycling culture in Nigerian construction Industry.

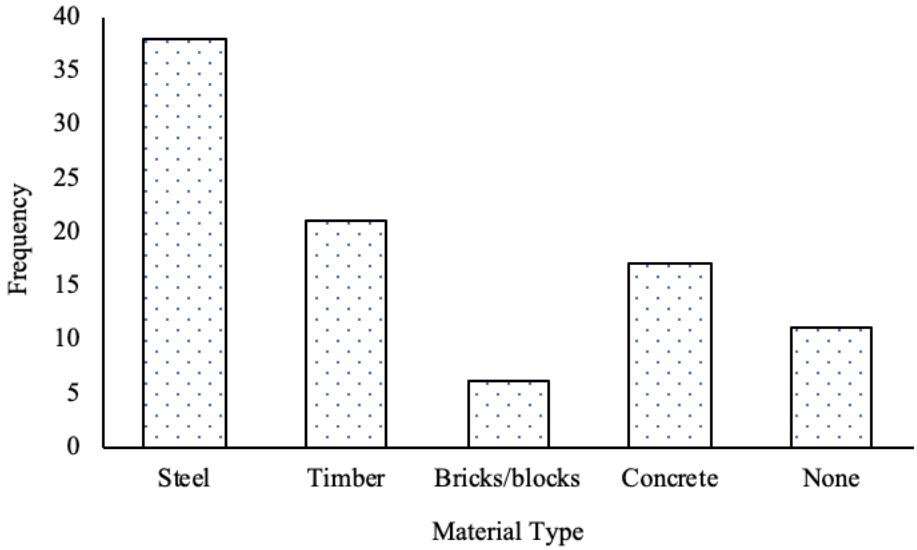

Figure 1. Material Recovery

3.4 Waste & Resource Efficiency

Most of the respondents indicated that material waste is high (33.90%) or moderate (23.73%) as shown in Figure 2. In addition, 57.63% noted that materials are not often reused (Figure 3). This shows that there is considerable waste of materials in the Nigerian construction industry.

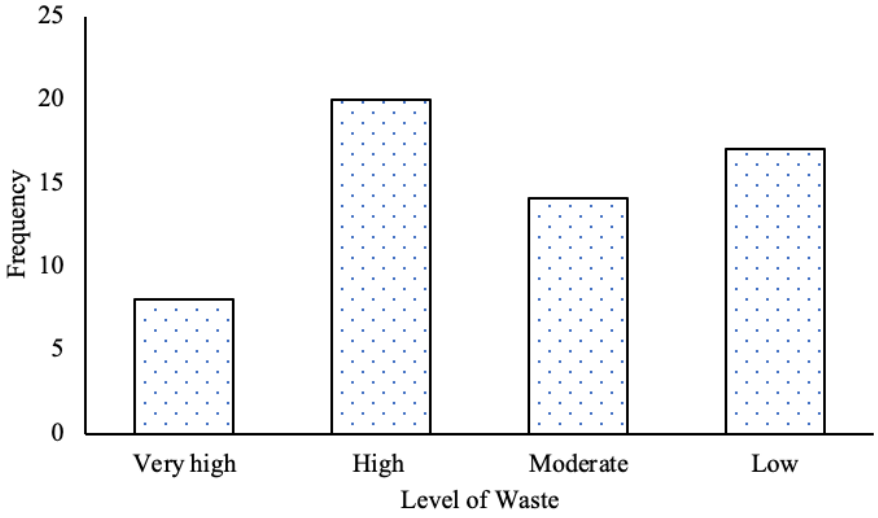

Figure 2. Level of Material Waste in Construction Industry

Most of the respondents indicated that material waste is high (33.90%) or moderate (23.73%) as shown in Figure 2. In addition, 57.63% noted that materials are not often reused (Figure 3). This shows that there is considerable waste of materials in the Nigerian construction industry.

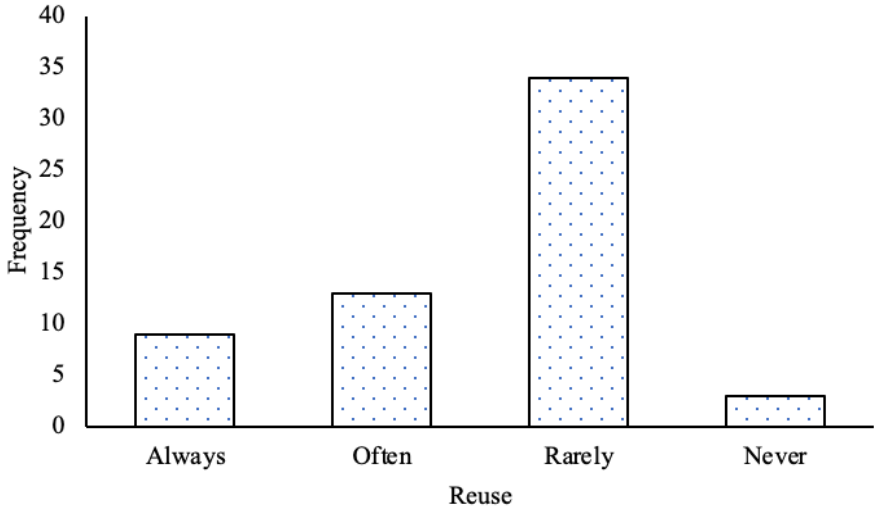

Figure 3. Frequency of Material Reuse

3.5 Awareness of Circular economy

A high percentage of respondents are aware of circular economy concepts (Figure 4). This shows that the level of awareness of sustainability concept and sustainable construction practices is high among construction professionals in Nigeria. This high level of awareness may be attributed to increasing global and local discussions on sustainable construction, waste reduction, and environmental management in the construction industry. However, even with such level of awareness, there are barriers impeding the implementation of deconstruction and reuse of materials.

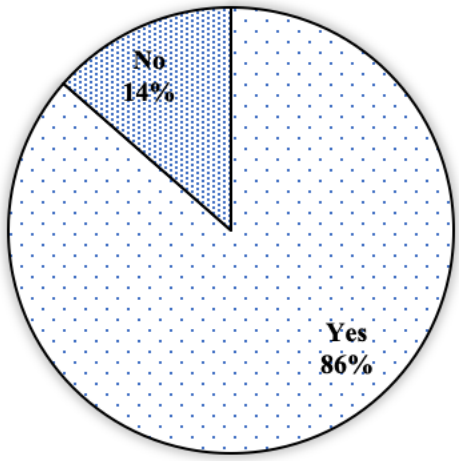

Figure 4. Awareness of Circular Economy among Construction Professionals in Nigeria

The gap between awareness and practice is in line with the assertion made by Ubayi (2025) and Unegbu et al. (2025) in their observation that despite the increase in awareness of professionals on circular economy, the biggest problems currently faced is not knowledge-related but logistical and involve poor availability of recycling facilities, lack of technology and institutional capacity. This also agrees with the observations made by Bello (2025), who noted that to close the gap between academic understanding and practical application on site, what is needed is a genuine partnership between policymakers and industry, combining smart incentives with real investment in recycling facilities and equipment.

3.6 Perception of Deconstruction

Table 3. Deconstruction improves efficiency

Response category	Frequency	Percentage (%)
Strongly agree	7	11.86
Agree	41	69.49
Neutral	6	10.17
Disagree	4	6.78
Strongly disagree	1	1.69
Total	59	100

The results in Table 3 indicate that most of the respondents agreed that deconstruction improves resource efficiency, with most of the responses falling under the agree option. This implies that there is a positive attitude towards deconstruction as an environmentally friendly activity. This positive perception is encouraging, as attitude often shapes behaviour.

3.7 Barriers to Deconstruction

Table 4. Challenges Limiting Deconstruction in Nigeria

Variable	Frequency	Percentage (%)	Rank
Lack of awareness	32	54.24	1
High cost	30	50.85	2
Lack of policy	22	37.29	6
Lack of recycling facilities	25	42.37	5
Time constraint	28	47.46	3
Lack of skilled labour	27	45.76	4

From the results in Table 4, lack of practical awareness appears to be one of the main barrier to deconstruction, indicating poor knowledge of the process among practitioners. High cost and time constraint also indicate that deconstruction is more expensive and takes longer time compared to traditional demolition processes. The lack of skilled labor indicates poor technical competence, whereas poor recycling facilities and lack of policy support reveal infrastructural and institutional obstacles. The identified barriers like high costs, time requirements, the availability of unskilled labour and limited recycling facilities, support the work of Akinade et al. (2015) and Adams et al. (2017).

3.8 Strategies for Improvement

Table 5. Strategies for Improvement

Strategy	Mean score	SD	Rank
Policy and regulation	4.49	0.67	1
Training and awareness	4.42	0.71	2
Material sorting on-site	4.39	0.74	3
Recycling facilities	4.02	0.82	4
Use of deconstruction method	3.92	0.88	5

Table 5 shows the recommended strategies that are crucial for improving deconstruction practices and increasing resource efficiency in Nigeria. Policies and regulations ranked first, indicating that respondents consider policy development plays a crucial role in improving deconstruction

practices. In other words, a regulatory environment is essential for promoting the concepts of recycling and circular economy in the construction industry.

Training and awareness were also rated highly, with a mean score of 4.42, indicating the need for professional education in terms of sensitizing the industry on how to address existing knowledge gaps and inefficiencies. Additionally, material sorting at the site (mean score = 4.39) was identified as one of the most important strategies in enhancing the process of recycling construction materials. Furthermore, providing recycling facilities (mean score = 4.02) is equally critical as it allows construction materials to be recycled for reuse purposes. Although, deconstruction methods ranked least among the identified strategies (3.92), it is still considered vital in promoting sustainable construction practices.

The importance of policy enforcement, awareness and infrastructure development as important tools also indicates that there is a need for coordinated action in improving efficiency. This is in line with the recommendations made by Ding (2014) about the importance of regulatory support, capacity building and investment in recycling facilities.

Overall, these results demonstrate that there is a greater awareness of circular economy theories but much needs to be done to overcome barriers and facilitate deconstruction in Nigeria.

3.9 Limitations of the Study

The study had a few limitations that need to be considered. First, the sample size used for the study was comparatively small, as compared to recent researches conducted on circular economy implementation in Nigeria. Secondly, the research has used a purposive sampling, and thus the findings can only represent the views of selected professionals having relevant industry knowledge, and not the entire construction industry. Thirdly, the analysis performed in this research is mostly based on descriptive statistics, therefore, the results obtained cannot be treated as statistically predictable. Moreover, the research was more centered around the formal construction process, therefore, it might have overlooked the contribution of the informal material recovery process and urban mining in developing countries such as Nigeria. Future research could incorporate a larger sample size and utilize more advanced statistical techniques like Structural Equation Modelling (SEM).

3.10 Practical Implication for the Industry

The findings suggest a number of concrete actions for different stakeholder groups. Construction companies can start by sorting materials on site, an intervention with a relatively low cost where they can determine which materials are worth recovering and reselling. Professional bodies, like the Nigerian Society of Engineers, have a role to play in integrating deconstruction techniques into their continuing professional development offerings thereby bridging the practical knowledge gap highlighted by respondents. Government intervention is also key: tax breaks for firms meeting certain recovery targets, or disposal fees that penalise landfilling, could change behaviour across the industry. They don’t need a lot of money, but they do need leadership and a willingness to get started.

4. Conclusion

This study investigated the application of circular economy in deconstruction in the construction industry of Nigeria by examining prevailing practices, barriers, and strategies of enhancing resource efficiency. From the findings, partial deconstruction was found to be prevalent compared to full deconstruction and demolition still being widely employed in the industry. Steel, timber and concrete were found to be the common materials that can be recovered through deconstruction processes, thus implying the possibilities of material reuse and waste generation reduction in construction projects.

The results showed that the circular economy principles awareness level among professionals in the construction industry is high, thus construction stakeholders are aware of the importance of sustainable construction practices. Moreover, the results revealed that majority of the respondents believed that deconstruction promotes sustainability hence a positive attitude towards the practice. Despite the above awareness and attitudes, deconstruction practices have not been fully adopted due to various challenges faced. The main barriers including low practical awareness of deconstruction, high cost, time constraints, lack of skilled labour, poor recycling facilities and weak policy support. These challenges suggest that there are institutional and infrastructural constraints, and economic and technical constraints that hinder the application of deconstruction in Nigeria.

The recommended actions to improve the situation include strengthening policy and regulatory frameworks, increasing training and awareness, improving on-site material sorting, improving recycling infrastructure and increasing the use of deconstruction methods. It is concluded that in order to achieve effective circular economy in Nigeria, there is need for collaborative efforts of government agencies and construction professionals with industry stakeholders through policy enforcement, capacity building, infrastructure development and sustainable construction initiatives.

This study contributes to the body of knowledge by empirically demonstrating deconstruction practices and circular economy implementation in the Nigerian construction industry.

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