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An Assessment of Stakeholders' Engagement in Building Material Recovery Within Circular Economy Frameworks in Abuja, Nigeria

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Abstract

Urban development in cities is associated with increased construction and demolition (C&D) waste generation, creating a need for material recovery practices. This study evaluates stakeholder engagement across the construction process and building material recovery (BMR) practices in Abuja, Nigeria. A quantitative cross-sectional survey was conducted using 344 structured questionnaires distributed to construction stakeholders; 168 responses were received, representing a 48.8% response rate. Data were analysed using relative importance indices, means, and percentages. The findings indicate that early stakeholder engagement during planning and design was considered the most important stage (M = 3.86). However, on-site BMR planning was very weak. Off-site reuse and resale through informal secondary markets dominated material valorization (mean = 3.98). In contrast, formal contractual mandates for the circular economy (CE) (mean = 2.90) and recycled-material procurement specifications (mean = 2.50) were substantially underdeveloped. This reveals a disconnect between engagement priorities and recovery implementation. The study concludes that BMR in Abuja remains largely reactive and driven by informal markets, rather than being proactively planned and engineered. This pattern limits the systematic recovery of construction materials and may constrain environmental performance. The study recommends institutionalizing regulatory frameworks that support material recovery, requiring pre-demolition audits to identify reusable and recyclable materials, and establishing formal public-private partnerships (PPPs) to develop C&D waste processing infrastructure. These measures could strengthen planning, procurement, and recovery pathways, while improving the environmental performance of construction projects. The findings provide evidence to inform policy and industry interventions aimed at embedding circular economy principles within Abuja's construction sector.

Keywords

Building Material Recovery;
Circular Economy;
Stakeholder Engagement;
Environmental Performance Outcomes;
Construction and Demolition Waste;
Abuja.

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Introduction

Urban transformation in most major cities centres of Africa are associated with massive growing construction activities, generating substantial quantities of construction material waste (El-bouayafy & Radoine, 2023; Purchase et al., 2022). Cities such as Abuja has witness heavy construction activities with rapid growth and increase environmental challenges from construction and demolition waste (Abah et al. 2023). Stakeholder engagement was identified as a sustainability initiative due to the diverse construction material waste occurring. Transitioning from conventional waste management to CE practices requires active, continuous collaboration among diverse construction stakeholders (Ghisellini et al., 2016). CE refers to a sustainable approach which encourages reuse, recycling, remanufacture and recovery of resources. In BMR, engagement of stakeholders begins early design decisions making through dismantling of components on on-site and their re-integration downstream (Freeman, 2010).

Stakeholder engagement plays a vital role in determining the success of CE initiatives. Active involvement from government agencies, construction firms, waste management organizations, local communities and environmental groups promotes shared responsibility, resource sharing and innovation (Bello, 2025). Studies such as Jassem et al. (2022), Thijssens (2022) and Arezina (2024), show that higher levels of stakeholder engagement are linked to better Environmental Performance Outcomes (EPOs); the measurable results that indicate the success of CE practices such as waste diversion rates, reductions in landfill use, resource conservation, lowered pollution levels and decreased greenhouse gas emissions. Without stakeholder engagement waste management, pollution could be ineffective and caused economic losses.

In Nigeria, however, stakeholder engagement in waste management is generally weak; policies are often poorly implemented and incentives for recycling are limited (Rezk et al., 2024). This leads to low recovery rates and continued reliance on open dumping and burning (Ogunseye et al., 2023). This was compounded further as there was no closed loop supply chain. Professional design teams would not interact with the demolition's teams and the informal operators. There is also lack of empirical research connecting stakeholder engagement to environmental performance in this context, representing a significant gap that this study seeks to fill.

Despite global growing awareness of BMR, the extent to which stakeholders engage in within developing countries remains inadequately documented (Ayarkwa et al., 2020). Little is known about how collaboration across sectors can lead to improved waste diversion through different stages of construction in rapidly expanding capital cities. This study assesses the extent of stakeholder engagement in BMR across construction project phases among stakeholders within the Federal Capital Territory (FCT), Abuja. Furthermore, it investigates the direct linkage between stakeholder engagement levels and corresponding environmental performance outcomes to provide actionable pathways for sustainable urban development.

Methodology

The study adopted a quantitative cross-sectional design using well-structured questionnaires distributed to 344 construction stakeholders in Abuja through their various online platforms using Google Form out of which 168 responses (48.8%) received. Stakeholders engaged in construction projects that use CE and BMR techniques are included in the target population. These include Architects, Builders, Civil Engineers, Developers, Regulatory Authorities (Development Control Department, Abuja Environmental Protection Board (AEPB)) and Salvage entrepreneur.

The chosen target population are the key decision stakeholders within the FCT construction material cycle. Each stakeholder has influence over different factors related to the CE. This needs to be considered to fully understand the range of factors influencing material recovery. Stakeholders were assessed using a

5-point Likert scale. Data were analyzed using relative importance indices, mean scores (MS), and standard deviations to highlight the level of stakeholder engagement across the project lifecycle in FCT, Abuja.

Results and Discussion

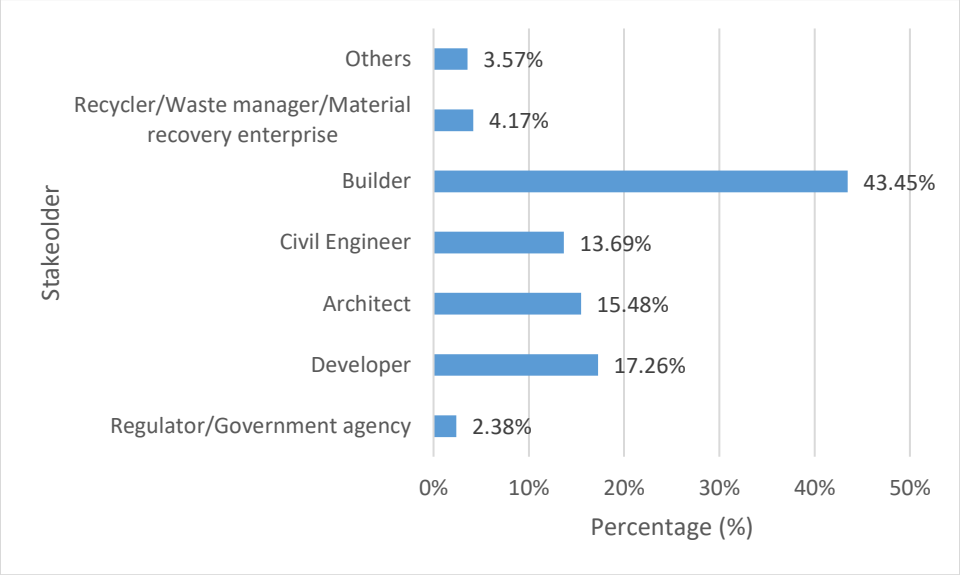


Figure 1. Respondent Stakeholders in Construction

Figure 1 show the frequencies of the respondent stakeholders in construction circle who respondent to the questionnaires. It can be observed that out of 168 respondents 43.45% with the highest response rate are Builders, followed by Developers with 17.26%, Architects with 15.48%, Civil Engineers with 13.69% and those with the lowest response rate are the Regulatory bodies (2.38%). With the balance representation of professional respondents especially with the Builders, findings of the study lean toward practical and onsite construction activities involving BMR.

Figure 2 show the educational qualification of respondents with Master's degree holders having the highest frequency rate of 54.76%, followed by Bachelor's degree/HND with 37.50% and the least qualification is PhD holders with 2.38%. From the result, the predominance master's degree reflects a strong balance between academic and professional knowledge of the respondents.

Figure 3 show the years of working experience of the respondents. It can be seen that most of the respondents have working experience of greater than 10 years and that majority (67) with frequency of 39.88% have an excellent working experience of more than 15 years which made the study to receive opinions from well experienced professionals.

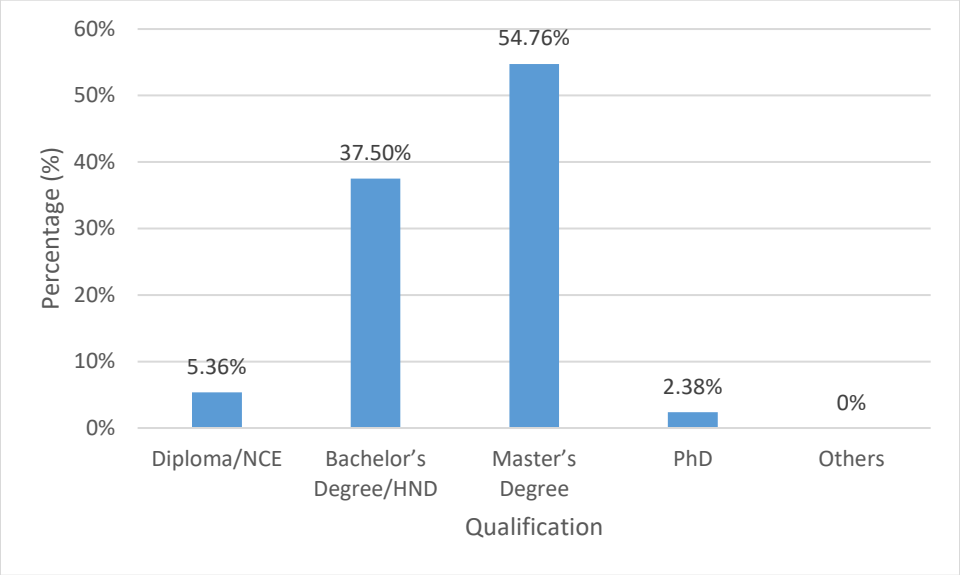


Figure 2. Educational Qualification of Stakeholders

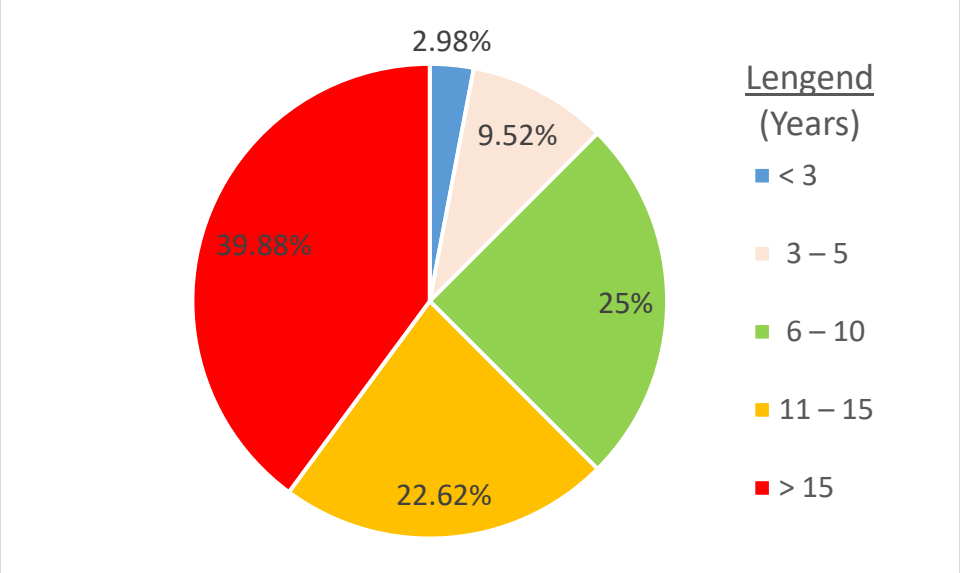


Figure 3. Stakeholders Years of Working Experience

Table 1 shows the response of stakeholders' engagement in BMR. It can be seen that the type of projects the respondents are engaged in are; New building construction with 131 having the highest frequency of 77.98%, this was closely followed by renovation work with 108 (64.29%), infrastructure work with 72 (42.86%) and 55 with the lowest frequency of 32.74% engaged in demolition. This result highlights inconsistency in CE practices since majority of the respondent's participation is heavily skew toward new construction and renovation instead of demolition and deconstruction. This therefore shows the importance of implementing Cradle to Cradle at the beginning of construction. This is aligned with the perspective of Ghisellini et al. (2016) who observed that transitioning from conventional waste management to CE practices requires active, continuous collaboration among diverse construction stakeholders which is lacking in the Nigerian context.

Table 1: Stakeholder Engagement in Projects

S/n	Variable	Options	Frequency (No)	Percentage (%)
1.	Type of Project(s) Engage In	a. New building	131	77.98
		b. Renovation	108	64.29
		c. Demolition	55	32.74
		d. Infrastructure	72	42.86
		g. Others	0	0
2.	Engage in project with building material recovery in the last 3 years	a. Yes	92	54.76
		b. No	76	45.24
		Total	168	100
3.	Number of relevant CE projects Engaged in FCT (last 3 years)	a. 0	81	48.21
		b. 1 – 2	36	21.43
		c. 3 – 5	49	29.16
		d. 6 – 10	1	0.6
		e. > 10	1	0.6
		Total	168	100

The table also showed that 92 stakeholders with frequency of 54.76% are engaged in building materials recovery projects in the past 3 years, while 76 stakeholders with frequency of 45.24% were not. This indicate that while material recovery is gaining ground within the construction industry, it still has not yet gain acceptance especially in the developing countries showing a wide margin of 48.21% either not aware or non-implementation. The number of relevant CE projects engaged in, shows that 49 stakeholders with the highest frequency of 29.16% participated in 3 – 5 CE projects in the last 3 years, while 36 (21.43%) stakeholders participated in 1 – 2 projects. A large proportion of 81 stakeholders with frequency of 48.21% notably have no involvement in CE projects within the same period. This non participation indicates a significant implementation shortfall in CE practices within the FCT.

Table 2: Stakeholders' Engagement in Building Material Recovery Activities

S/n	Engagement Activities	Frequency (f)					Σf	Σfx	Mean	Rank
		1	2	3	4	5				
1.	Stakeholder engagement activities are formally included in material recovery planning.	3	10	30	36	13	92	322	3.20	6th
2.	Engagement begins early in the planning or design phase.	3	10	20	23	36	92	355	3.86	1st
3.	Relevant stakeholders (recyclers, community, contractors, regulators) are adequately represented.	2	20	30	33	7	92	299	3.25	5th

4.	Engagement is continuous throughout the project lifecycle.	7	13	26	26	20	92	315	3.42	3rd
5.	Decision-making processes involve multiple stakeholder groups.	0	7	43	32	10	92	321	3.49	2nd
6.	Clear communication channels exist between all stakeholders.	3	13	40	27	9	92	302	3.28	4th

Where; 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

Table 2 ranks stakeholders' agreement with engagement activities in building material recovery. Stakeholders ranked 'engagement begins early in the planning/design phase' as the 1st activity in BMR with a mean of 3.86. This high ranking indicate that efficacy of CE starts with proactive front-end planning. This was followed by 'decision making processes involve multiple stakeholder groups' ranked 2nd with mean of 3.49, the 3rd ranked activity was 'engagement is continuous throughout the project lifecycle' with mean of 3.42. The 4th activity ranked by the stakeholders with a mean of 3.28 was 'clear communication channels exist between all stakeholders.

The two last ranked activities (5th and 6th) were 'relevant stakeholders (recyclers, community, contractors, regulators) are adequately represented' and 'stakeholder engagement activities are formally included in material recovery planning' with means of 3.25 and 3.20 respectively. This reveals that while early communication is very importance, material recovery planning is lacking on the sites. This is supported by Ajayi et al. (2017) who noted that lack of design protocol regularly prevents effective material recovery.

Quantitative assessments from high level regulators were sought. Regulators recognized developers had an active role in early planning stages. However, responses indicated they focused mainly on creating new projects rather than circular recovery. A key concern from the regulator was:
"They are strong in projects making but tools limit our ability to measure environmental performance. The engagement mechanisms must change."

Also, a lack of community level and informal sector integration that marginalizes recovered elements was noted:
"Everything about CE begins with policy, awareness creation and ends with action, we must highlight public choices to change the sociology of the general public's inferiority complex regarding the use of recycled materials versus virgin materials."

From the Stakeholder theory, while the key economic actors are noticeably and visibly, the secondary actors are excluded from the early planning stage. This is align with institutional theory which state that lack of formal contract mechanisms means weak normative pressure in professional institutions. Resulting to projects prioritize conventional, linear development methods instead of the formal circular methods.

Table 3: Application of Circular Economy in BMR

S/n	Application of CE in Material Recovery	Options	Frequency (No)	Percentage (%)
1.	Consistency of Avoiding Unnecessary Materials in Project Planning	a. Never	0	0
		b. Occasionally	13	14.13
		c. Sometimes	25	27.17
		d. Often	41	44.57
		e. Always	13	14.13
		Total	92	100
2.	Extent of Materials Reduced Through Efficient Design and Construction Methods	a. Very small	0	0
		b. Small	12	13.04
		c. Moderate	43	46.74
		d. Large	30	32.61
		e. Very large	7	7.61
		Total	92	100
3.	Frequently of Components Reused across Projects	a. Never	0	0
		b. Occasionally	19	20.65
		c. Sometimes	51	55.44
		d. Often	22	23.91
		e. Always	0	0
		Total	92	100
4.	Frequency of Materials Repaired, Refurbished, or Remanufactured Instead of Discard	a. Never	10	10.87
		b. Occasionally	26	28.26
		c. Sometimes	46	50
		d. Often	10	10.87
		e. Always	0	0
		Total	92	100
5.	Effectiveness of Materials Recycle into New Construction Inputs	a. Not effective	3	3.26
		b. Slightly effective	29	31.52
		c. Moderately effective	43	46.74
		d. Very effective	17	18.48
		e. Extremely effective	0	0
		Total	92	100

Source: Field Survey (2026)

Table 3 shows stakeholders' perceptions on the effectiveness of CE principles in BMR. Consistency of avoiding unnecessary materials in project planning was scored as 'often' with frequency of 44.57%, this was followed by 'sometimes' with 27.17% while the last was 'never' with frequency of 0%. The stakeholders scored 'extent of materials reduced through efficient design and construction methods' as 'moderate' with frequency of 46.74%, followed by 'large' (32.61%), 'small' (13.04) and 'very small' as the last with frequency of 0%. The results indicate that stakeholders are consistent in avoiding unnecessary material waste through efficient design and construction method. This aligns with Idris and Bello (2023) findings where design for disassembly and redesign product to be more durable were ranked very high.

Frequent components reused across projects was also assessed. It was observed that 55.44% ascertained that 'sometimes' reused components are used, 23.91% 'often', 20.65% 'occasionally' while 0% 'never' reuse.

The Frequency of materials repaired, refurbished, or remanufactured instead of discard was assessed. Stakeholders ascertained that 50% 'sometimes' repair and refurbish materials instead of discard, 23.91% 'often' do, 28.26% occasionally, 10% 'often', 10% 'never' and least 0% 'always'. On the effectiveness of materials recycle into new construction inputs, 46.74% ascertained 'moderately effective', followed by 'slightly effective' with 31.52%, 18.48% 'very effective', 'not effective' with 3.26% and 0% for 'extremely effective'. The results indicate that materials are repaired, reused and recycled following the implementation of hierarchy of waste materials (R principles) as observed by Ghaffar et al. (2020).

Table 4: Ranking Principles of CE as Applied in the Project Executed

S/n	Variable	Frequency (f)					Σf	Σfx	Mean	Rank
		1	2	3	4	5				
1.	Material audits before demolition (inventories, condition assessment	0	12	23	34	23	92	344	3.74	3rd
2.	On-site sorting/segregation of waste streams	0	17	26	26	23	92	331	3.60	4th
3.	Source separation for high-value materials (metals, timber, blocks, fittings)	0	13	13	50	16	92	345	3.75	2nd
4.	Reuse on the same site (e.g., blocks, doors, fixtures)	10	13	43	19	7	92	276	3.00	10th
5.	Off-site reuse/resale (markets, social enterprises)	0	3	20	50	20	92	366	3.98	1st
6.	Recycling partnerships with licensed handlers	10	17	33	20	10	92	273	2.97	11th
7.	Use of secondary or recycled materials	5	16	34	30	7	92	294	3.20	6th
8.	Design for deconstruction (reversible connections, material passports)	2	17	43	27	3	92	288	3.13	7th
9.	Material traceability (labelling, tagging, digital tools)	10	16	30	33	3	92	279	3.03	9th

10.	CE requirements included in contracts	9	27	23	30	3	92	267	2.90	13th
11.	Training for site crews on CE and recovery	12	23	20	30	7	92	273	2.97	11th
12.	Procurement specifying recycled/secondary materials	17	25	40	7	3	92	230	2.50	14th
13.	KPIs for recovery (e.g., % diversion) in project reporting	9	10	40	26	7	92	288	3.13	7th
14	R-Strategies (Reduce, Reuse, Repair, Refurbish, Remanufacture, Repurpose, Recycle)	9	10	23	30	20	92	318	3.46	5th

Where; 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

Source: Field Survey (2026)

Table 4 ranked the principles stakeholder apply to projects on site. The principle of 'off-site reuse/resale (markets, social enterprises)' ranked 1st with mean of 3.98, followed 2nd by 'source separation for high-value materials (metals, timber, blocks, fittings)' with mean 3.75. The 3rd most important factor was 'material audits before demolition (inventories, condition assessment' (M=3.74), followed by sorting/segregating waste on site (M=3.60). R-Strategies (Reduce, Reuse, Repair, Refurbish, Remanufacture, Repurpose, Recycle) was ranked 5th (M=3.46). This indicates that auditing and sorting should take place before demolition.

The 6th most important factor was using recycled/secondary materials (M=3.20). With 'design for deconstruction (reversible connections, material passports)' and KPIs for recovery (e.g. % diverted) in project reporting tied for 7th (M=3.17). Material traceability (labelling/tagging/digital) was 9th (M=3.03). Reusing the same site (e.g. blocks, doors, fittings) was 10th (M=3.00). Recycling partnerships with licensed handlers and training for site staff on CE and recovery were both 11th (M=2.97). The least important factors were CE requirements in contracts (M=2.90) and procurement of recycled/secondary materials (M=2.50). This can be seen to indicate that material recovery is done on a reactive basis.

Qualitative data indicated that material recovery is done based on secondary informal markets. One of the interviewed regulators said,

"As much as we should be using modular, pre-fabricated, demountable systems with standard joints in design we are not doing this currently as everything is driven by the informal market."

Another said a change in structure is needed,

"Recycling plants for C&D waste should be promoted through Joint Venture (JV) and PPP in Abuja so we can implement real CE strategies as we have no formal processing centers."

This could be looked at through an ecological modernization lens. Where sustainability (green technology and secondary materials) are embedded in the industrial supply chain then environmental benefits are maximized. Materials of high value are sold to informal hubs however these hubs do not use recycled materials in new construction.

The results of this study provide insight to how stakeholders engage with the construction sector within Abuja to implement a CE. The fact that builders and developers were the most common stakeholder indicates that the industry is very pragmatic. Early engagement in planning and design was identified as the most important (M=3.86) which supports theories

of early engagement being essential to reduce waste. However, looking at Table 1, it can be seen that despite professionals knowing early engagement is important 77.98% of projects are new build. Only 32.74% of projects are demolition/deconstruction. This indicates stakeholders are not actively implementing CE strategies even though they are aware of them. Offsite resale through informal markets was also found to be very important (M=3.98).

However, this highlights a lack of engagement through formal contracts (M=2.90) and recycling in procurement (M=2.50). This is in line with Institutional Theory as there is no strict regulation and therefore there is no financial incentive for professionals to implement CE strategies. Material recovery is currently happening through informal means (informal operators) due to the lack of green procurement strategies. This does result in a high amount of diversion however there is no environmental compliance. This results in low Environmental Performance Outcomes (EPOs) with materials being dumped freely. To resolve this, institutional policies should be implemented to align with the stakeholder engagement on site.

Conclusion

This study assessed stakeholders' engagement with BMR in the Federal Capital Territory (FCT), Abuja, within circular economy strategies. The results showed that whilst stakeholders recognize the importance of engaging early and auditing before demolition, the industry is heavily focused on linear processes. There is little engagement with contracts to implement circular strategies. Therefore, material recovery is based on informal secondary markets. To create sustainable urban development the construction industry needs to move away from informal disposal methods and implement legal circular supply chains.

Recommendations

1. Mandatory Policy and Regulatory Integration: Regulatory authorities (such as the Abuja Environmental Protection Board and the Development Control Department) should mandate Pre-Demolition Audits (PDAs) and integrate CE key performance indicators (KPIs) into statutory building approval processes.
2. Public-Private Partnerships (PPPs) for Recycling Infrastructure: Government agencies should collaborate with private investors and academic institutions to establish formal C&D waste recycling plants across the FCT, thereby providing certified processing destinations to replace informal dumping.
3. Contractual Inclusion of CE Standards: Construction clients, consultants, and developers should incorporate explicit circular clauses, design-for-deconstruction (DfD) protocols, and material passport requirements into standard contract forms.
4. Capacity Building and Supply Chain Formalization: Professional bodies (such as the NIOB, NIA, and COREN) should organize mandatory continuous professional development (CPD) training on material traceability, while formalizing linkages between mainstream construction firms and informal operators/recyclers to upgrade recovery standards.

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