



PROJECT MANAGEMENT
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A.J. CLARK SCHOOL OF ENGINEERING
Civil & Environmental Engineering Department



RESPONSIBILITY FOR MINIMIZING CONSTRUCTION MATERIAL WASTE

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Background

- Waste is inevitable on construction projects but can be minimized.
- There is a clear difference between waste minimization and management
- Waste management methods are:
 - End of pipe solutions
 - Can not prevent waste generation
 - Some of the methods consume energy and emits CO₂





- Waste can be minimized at the design, procurement and construction phases.
- Design strategies includes:
 - Design for off-site construction
 - Design for use and recovery
 - Design for waste efficient procurement
 - Design for deconstruction and flexibility
 - Design for material optimization





- Procurement strategies
 - Just in time (JIT) material delivery
 - Material stock taking
 - Material with fewer packaging
 - Careful storage
 - Avoiding over-ordering
- Construction strategies:
 - Prefabrication
 - Pre-casting
 - Modular construction
 - Demountable building techniques





- Waste minimisation and management is a challenge in the Nigerian construction industry
- The discourse as to who should be responsible continues to ravage the industry
- Who should be responsible for minimizing waste?





Roles and Responsibilities

- Roles in construction projects can be divided into four:
 - Craft (e.g. wood, plant)
 - Technical (e.g. estimator, technician)
 - Professional (e.g. architect, quantity surveyor)
 - Managerial (senior executive, project manager)

Source: Warwick Institute for Employment Research (2010)





Key responsibilities of construction workforce

		Construction Phase		
		Pre	During	Post
Project Player	Key Responsibility			
Architect	The professionals concerned with the design, material specification, and building aesthetics.	✓	✓	✓
Project/Site Managers	Those responsible for the day-to-day activities on a building project from its inception to completion.	✓	✓	✓
Contractors/Developers	Those responsible for the construction and completion of building projects as well as the management of sub-contractors.		✓	
Builders	The professionals responsible for building construction management and maintenance.		✓	✓
Quantity Surveyors	The professionals responsible for cost control, estimation, procurement, and calculation of material costs and work done.	✓	✓	✓



Labourers	Those responsible for carrying out tasks set by supervisors	✓	✓	
Client(s)	An individual or a group that engages all other professionals and commissions the project.	✓	✓	✓
Engineers	The professionals concerned with the structural stability and strength of buildings.	✓	✓	✓
Government	Agencies responsible for ensuring compliance to building codes and regulations.	✓	✓	✓
Sub-contractors	Those responsible for completing part or all of a project as allocated to them.		✓	
Material Suppliers	Those responsible for supplying diverse types of materials as required for the project.		✓	

- Responsibilities can be categorised into four:
 - Causal responsibility
 - Legal responsibility
 - Moral responsibility
 - Role responsibility

Source: Klein (1995)



Methodology

- Strategy - Survey research design (Questionnaire)
- Instrument – Questionnaire (email & web based)
- Population – Nigerian construction industry
- Sample – Building construction firms in Lagos
 - Random sampling from an online register of firms in Nigeria (www.vconnect.com)
- Data Analysis – Relative Importance Index
 - $RII = \sum_{\text{responses}} \frac{w}{A*N}$ Where w = weight (1, 2, 3, 4, 5...), A = highest weight, and N = Total number of responses





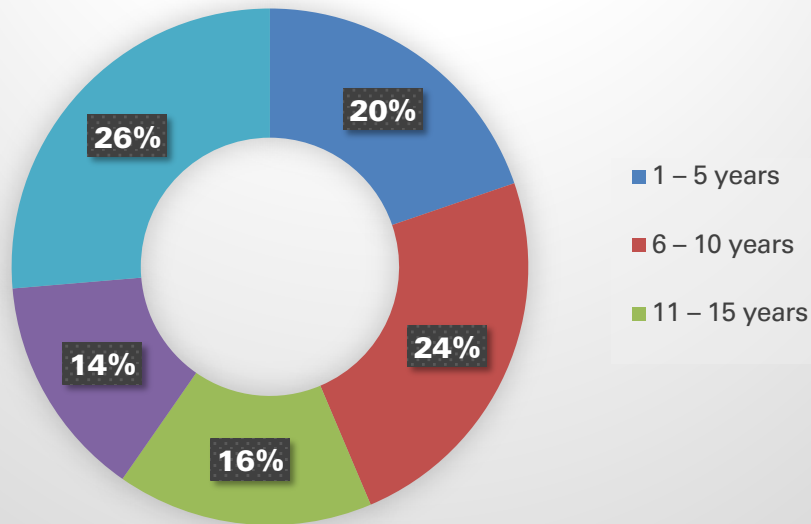
Findings and Discussion

- Response rate
 - No of Questionnaire distributed = 730 (700 online, 30 face-to-face)
 - No of duly completed questionnaire = 243
 - **33.3%**

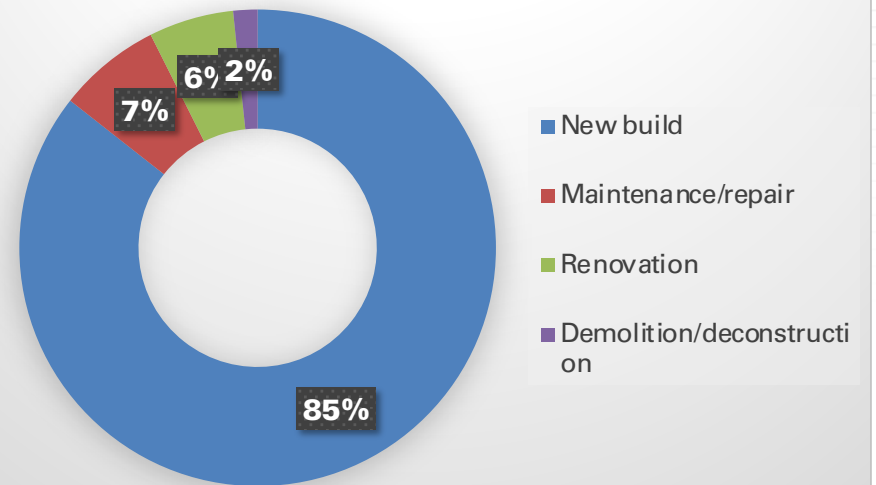
Respondents' job description		
	Frequency	Percentage
Urban planner	1	0.4
CEO	14	5.8
Manager	7	2.9
Project Manager	40	16.5
Architect	88	36.2
Engineer	25	10.3
Contract/Quality Manager	2	0.8
Quantity Surveyor	53	21.8
Builder	11	4.5
Technician	2	0.8
Level of Educational		
Ordinary National Diploma	2	0.8
Higher National Diploma	30	12.3
Post Graduate Diploma	10	4.1
Bachelor Degree	78	32.1
Master Degree	120	49.4
PhD	3	1.2



Age of organization

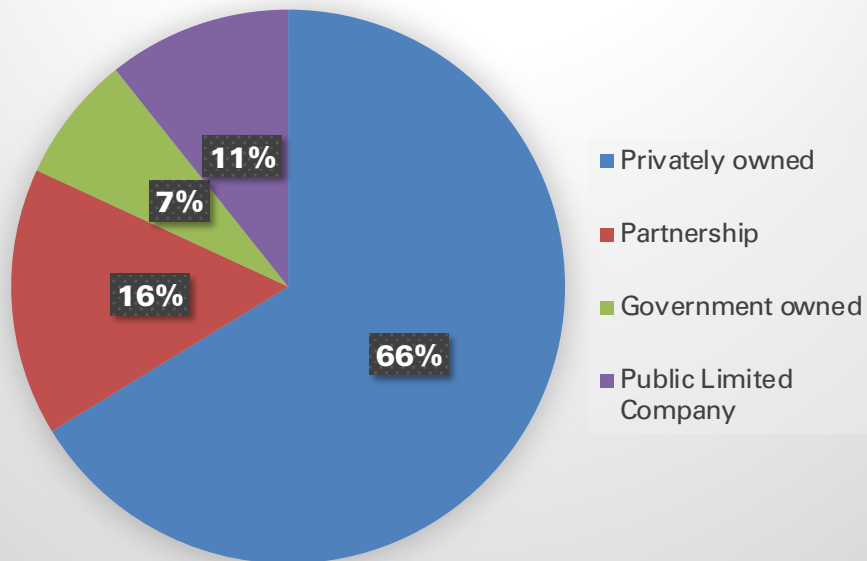


Project specialization

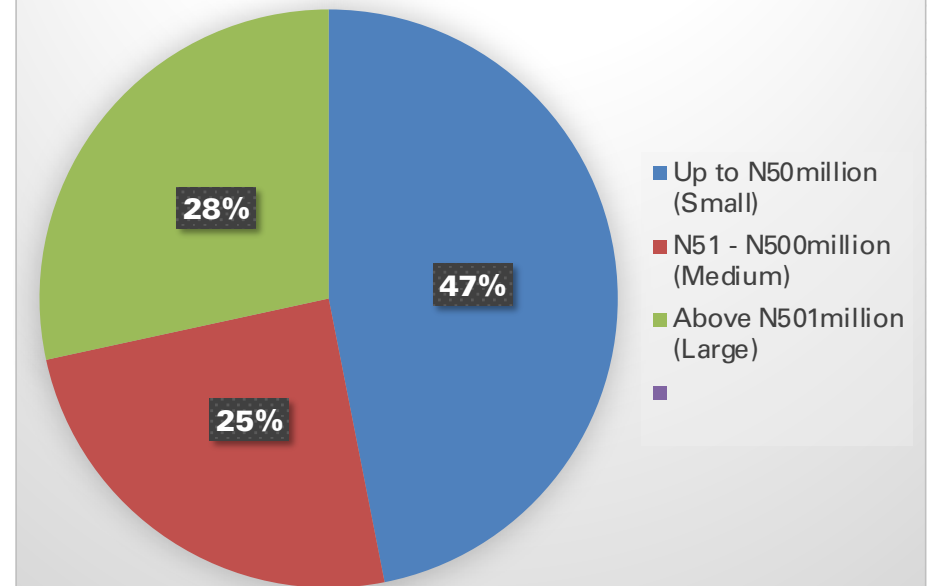




Company ownership status



Company size



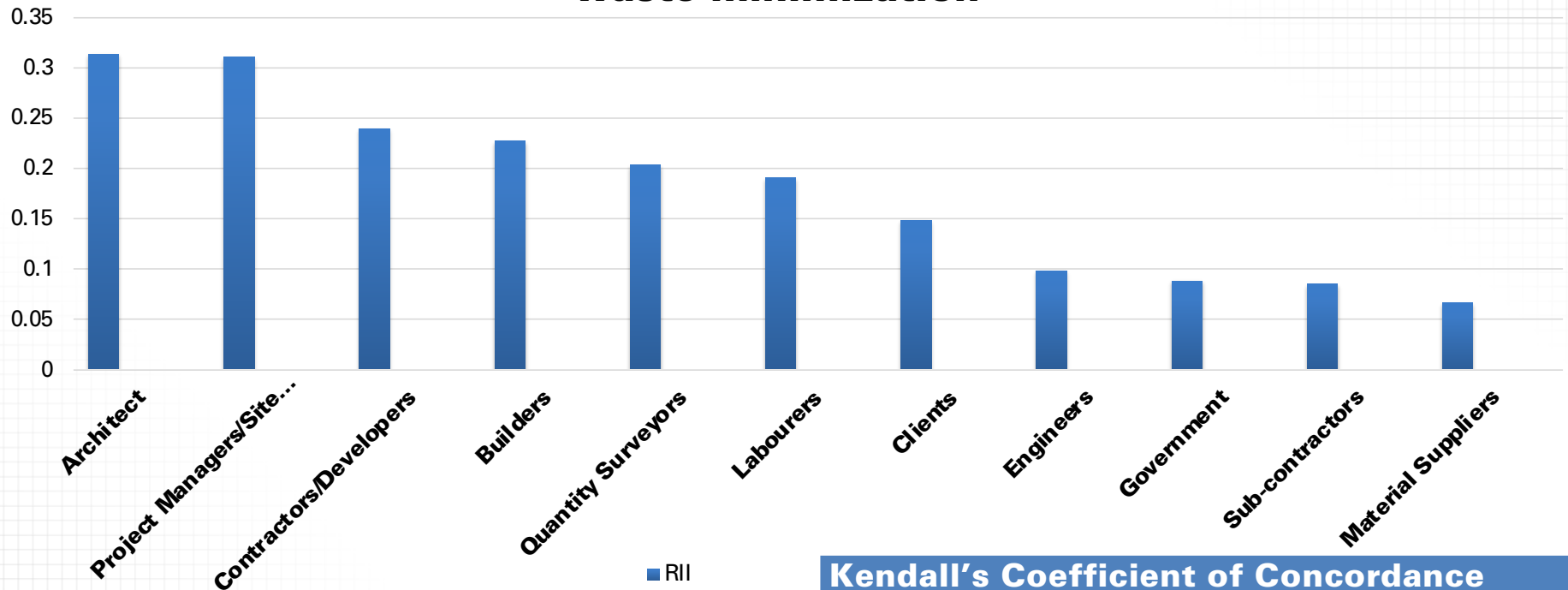


- Stakeholders responsible for minimizing construction waste in the Nigerian construction industry are:





Relative Importance Index of stakeholders responsible for waste minimization



Kendall's Coefficient of Concordance	
χ^2	7.600
df	2
Asymp. Sig.	0.022
Kendall's W ^a	0.760



- This finding aligns with that of Osmani et al. (2006) that architects need to prioritise waste minimization design practices.
- Previous studies (Ajayi, 2017; Osmani et al., 2008; Ola-Adisa, Sati, & Ojonugwa, 2015; Liu, Osmani, Demian, & Baldwin, 2015) have recommended that architects take proactive measures by adopting waste minimization strategies at the design phase.
- Project managers through their managerial roles and skills can contribute to waste minimization by ensuring appropriate planning of construction processes and activities.



- The implication of the finding for practice is that waste minimization should be considered at all phases of construction and by all project stakeholders including operatives.
- Contract documents need to clearly specify the roles and responsibilities of all parties involved in construction projects



Conclusion

- Waste can be minimized at all phases of construction
- Architects, project/site managers and contractors should be responsible for waste minimization
- All stakeholders including the government and material suppliers should also be responsible



Thank you

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