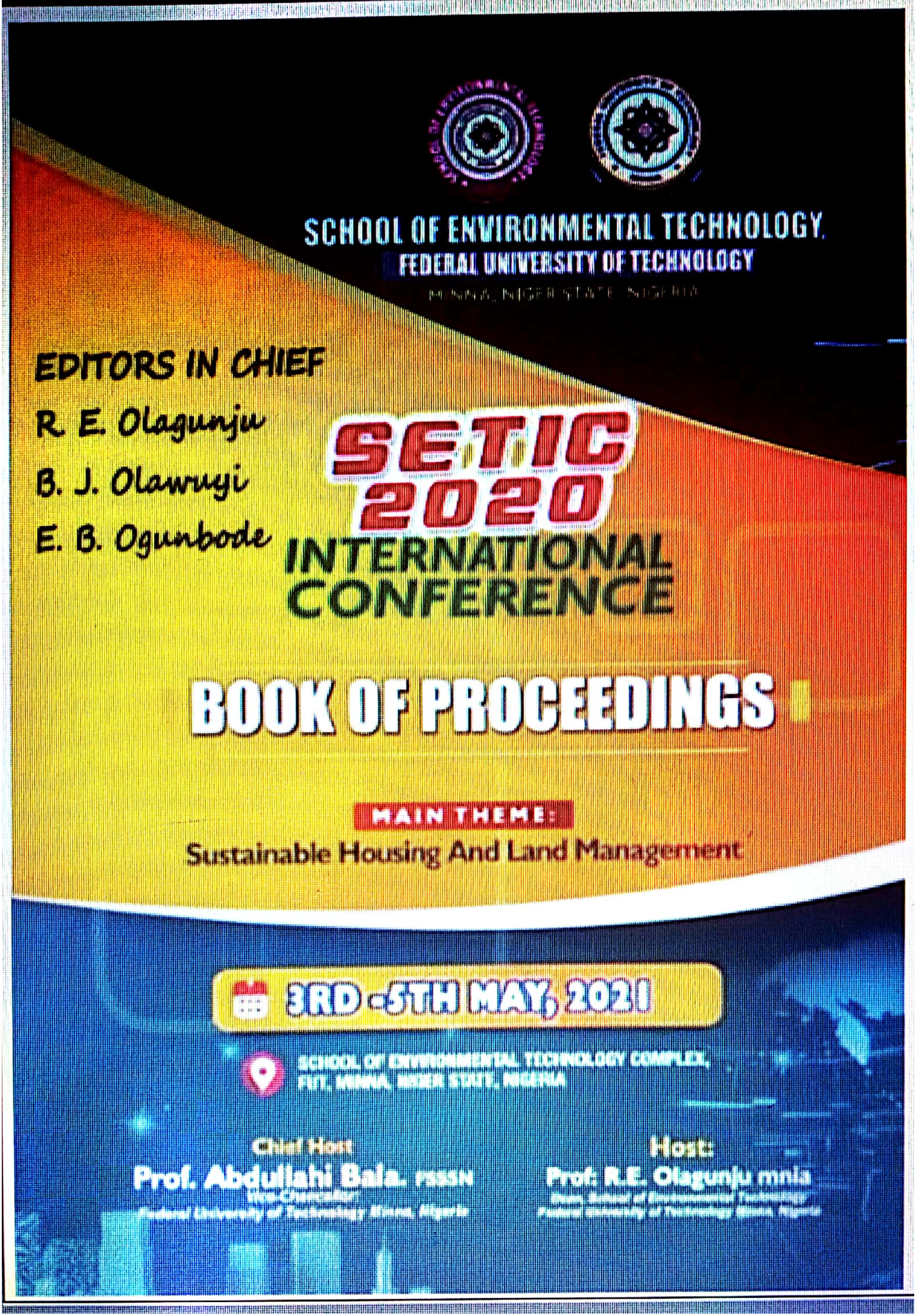

School of Environmental Technology International Conference (SETIC 2020)

3RD – 5TH MAY, 2021

Federal University of Technology Minna, Niger State, Nigeria

CONFERENCE PROCEEDINGS

EDITORS IN CHIEF

R. E. Olagunju
B. J. Olawuyi
E. B. Ogunbode

ISBN 978-978-54580-8-4

Proceedings of the 3rd School of Environmental Technology International Conference (SETIC 2020)

Published by
School of Environmental Technology,
Federal University of Technology Minna.
PMB 65, Minna,
Niger State Nigeria.

ISBN 978-978-54580-8-4

Influence of Material Waste Management on Construction Project Delivery in Abuja, Nigeria

Garba, Y. Y., Viza, Z. M. & Umar, M. I.
Department of Building, Federal University of Technology Minna, Nigeria
Corresponding author: [illegible]@futminna.edu.ng

Abstract:
Construction Waste Management is an aspect of Sustainable Development, which is fueled by the growing need of man for infrastructural amenities. Improper control of materials during different stages of construction has some influence on construction project delivery. The aim of this study was to assess the influence of materials waste management on construction project delivery in Abuja by identifying the sources of construction material waste, evaluating the influence of materials waste management on construction project delivery and the performance techniques and strategies of reducing construction materials waste in a construction project. Quantitative methodology was used, involving the use of questionnaires to obtain data which was analyzed to obtain the RII. The result revealed that the most influence of materials management on construction project delivery are; time overrun/delay, productivity, cost overrun/increase project cost, environmental impacts, brings contractors to disrepute among others. the results also reveal that the performance of some of the strategies of reducing the effects of materials waste management which are; materials planning method, materials handling, proper planning, monitory, and control of materials, and materials waste control. The researcher recommends the use of these strategies and measures to minimize the influence of materials waste management on construction project delivery

Keywords: *Waste Management, Project Delivery, Material Waste, Sustainable Development, Infrastructures*

1.0 INTRODUCTION

Constructions projects are sophisticated and complex processes that needs to be carried out by individuals with special set of skills and knowledge that is channeled toward achieving sustainable project deliver (Ochoolu & Moselhi 2013). According to Umar (2021) proper material waste management on construction sites leads to project that are delivered within acceptable cost and required standards thus providing facilities that are useful and functional to occupy. Waste management in construction site is very essential because improper management of materials during site activities has the potential to severely affect project performance and delivery (Mohammed, 2019). According to Takim & Akintoye (2012) the major issues that affect materials management activities include constraints on storage areas, site logistics concerning materials handling and distribution, ordering and delivery of materials to the construction site, improper storage, transportation difficulties and inappropriate materials delivery and non-compliance with specification according.

Construction activities generate wastes at various stages of the construction process from inception, right through the design, construction and operation stages of the built structure (Wahab & Lawal, 2011). According to Gulghane & Khandve (2015) construction waste is a complex waste stream made up of a wide variety of materials which are in the form of building debris, rubble, earth, concrete, Steel, timber, and mixed site clearance materials, arising from various construction activities including land excavation or formation, civil and building construction site, clearance, demolition activities, roadwork, and building renovation.

Wastage of materials will lead to increase in total cost of building project, this assertion is supported by (Mohammed, 2019), who opined that building material wastage on construction sites contributes to cost overruns, time overrun, productivity, litigation and environmental pollution. This implies that in-depth review, identification of causative factors of waste, assessment of these factors and any improvement in materials wastage management on construction sites will enhance the cost performance of projects delivered in Nigeria. This study therefore, intends to provide answers to the following research questions which include:

What are the causes of construction material waste?
What is the influence of materials waste management on construction project delivery?

2.0 LITERATURE APPRAISAL

2.1 Material Management

Materials management practice involves planning, coordinating and assessing the requirement for sourcing, purchasing, transporting, storing of materials to minimize wastage and optimize profitability (Umar 2021). According to Phu & Cho, (2014).Materials Management involves management system for planning and controlling all necessary efforts to make certain that the right quality and quantity of materials and equipment are specified in a timely manner, are obtained at a reasonable cost and are available when needed.

2.2 Construction Waste

Waste in construction occurs in various construction stages ranging from design to finishing and they emanate from wooden materials, concrese, gravels, aggregate, masonry, metals, plastic, plumbing and electrical fixtures, glass and material handling (Napier, 2012). According to Mohammed (2019), construction waste are materials transported off the construction sites or used within the construction sites for land filling, incineration, recycling, reusing or composting other than the intended specific purpose of the project as a result of material damage, excess, non-use, or non-compliance with the specifications or being a byproduct of the construction process. Construction waste are unwanted materials generated during construction, they include rejected structures and materials, materials which have been over-ordered or are surplus to requirements, and materials which have been used and discarded (Ahmed 2019)

2.2.1 Construction Material Waste

According to Gulghane & Khandve, (2015) construction waste can be divided into three namely: material, time and machinery. However, this research focuses on materials waste which according Kevin (2012) refer to materials on construction sites that are unusable for the purpose of construction. Similarly, according to Ameh & Itodo (2013) material waste include materials that are not needed on the site and needs to be transported away from the construction site, these materials are not used for their intended purpose of the project due to damage, excess or non-use or which cannot be used due to non-compliance with the specifications, or which is a by-product of the construction process.

2.3 Causes of Construction Materials Waste

According to Mohammed (2019) the main causes of construction waste are: Poor coordination of all parties during the design stage, Design changes, Lack of attention to the standard size of specific products, Error in contract documentation, Material delivery procedures, Material storage and internal transport. Similarly Shant, & Diphene, (2014) identifies Inappropriate storage, Errors by tradesman, Inclement weather, Equipment problems, Use of incorrect material, Accidents, Poor site management and supervision, Lack of coordination of responsibilities between contractor and subcontractors as some of the causes of construction material waste.

Dhanayake *et al.* (2009), found the causes of construction waste in Singapore construction industry sites are Lack of attention paid to dimensional coordination of products, Changes made to the design while construction is in progress, Lack of attention paid to standard sizes available in the market, Designer's unfamiliarity with alternative products, Complexity of detailing in the drawings, Lack of information in the drawings, Errors in contract documents,

Incomplete contract documents at commencement of project, Selection of low quality products, Errors by tradespersons or laborers, Accidents due to negligence and Damage to work done caused by subsequent trades. Similarly Adewumi & Otali (2013) identify the use of incorrect material, Delays in passing of information to the contractor on types and sizes of products to be used, Equipment malfunctioning, Damages during transportation, Inappropriate storage, Materials supplied in loose form, Unfriendly attitudes of project team and laborers, Theft, Ordering errors (e.g. ordering significantly more or less), Lack of possibilities to order small quantities, Purchased products that do not comply with specification as causes of construction material waste.

2.4 Influence of Materials Waste Management on Construction Project Delivery

Management of construction material is a new practice in the construction industry Ochesolu & Moselhi (2013). Therefore, reviews of literature summarize the influences material waste management will have on project delivery in Table 2.0. The influence of materials waste management on project delivery can be identified both from a positive and negative perspective effects. From positive effects, effective material management has a positive impact on time optimization, cost saving, quality maximization, productivity improvement and waste minimization. On the other hand, this research work will focus on the negative effects on project delivery such as time delay, cost overrun, poor quality, loss of productivity and excessive waste generation. However, in the table below more influence of materials waste management are listed.

Table 2.0 Influence of Materials Waste Management on Construction Project Delivery

S/N	Influence of Materials Waste Management on Construction Project Delivery
1.	Time overrun/delay
2.	Cost overrun/ increase project cost
3.	Dispute
4.	Arbitration
5.	Litigation
6.	Quality
7.	Productivity
8.	Total abandonment
9.	Insolvency as a result of loss
10.	Decrease in turnover
11.	Brings contractors to disrepute
12.	Environmental impact

Source: literature survey 2021

3.0 RESEARCH METHODOLOGY

Quantitative methodology was used which involves the use of questionnaire to obtain data. Questionnaire was used to collect data on the influence of materials waste management on construction project delivery in Abuja. The target population of the research was total [illegible] officially enlisted construction firms in Abuja obtained from the headquarters of the Federal Capital Territory Administration (FCTA), Abuja. Since not all the firms could be included in the study, a purposive sampling technique was adopted. This involves the deliberate selection of [illegible] construction firms in Abuja [illegible] sample size for this research work.

4.0 DATA PRESENTATION ANALYSIS AND DISCUSSION OF RESULTS

4.1 Demography of Respondents

It can be seen from [illegible] builders [illegible] of the respondents [illegible]

Table 4.1: Summary of Respondents Profile

Variable	Characteristics	Number of Respondents	Percentage (%)
Profession	Builders	15	34.9
	Architects	5	11.6
	Civic engineers	15	34.9
	Surveyors	8	18.6
	Total	43	100
Academic Qualification	HND	9	20.9
	BSC/BTECH	24	55.8
	PGD	7	16.3
	MSC/MTECH	3	7.0
	Total	43	100
Years of experience	Below 5	11	25.6
	5-10	21	48.8
	10-15	6	14
	15-20	3	7
	Above 20	2	4.6
	Total	43	100

Source: Field Work (2021)

4.2 Influences of Materials Waste Management on Construction Project Delivery

Table 4 presents the result of the study. There are various Influences of materials waste management causes posited in various literatures. Respondents were requested to choose in terms of relevance among the Influences of Materials Waste Management as seen in the Table.

Table 4.3: Influence of Materials Waste Management on Construction Project Delivery.

Influence of Waste Management	RII	Ranking
Time overrun/Delay	0.842	1
Cost Overrun/Increase project cost	0.833	2
Dispute	0.753	6
Arbitration	0.712	9
Litigation	0.740	7
Quality	0.735	8
Productivity	0.842	1
Total abandonment	0.791	4
Insolvency as a result of loss	0.702	10
Decrease in turnover and Profit	0.777	5
Brings contractor to disrepute	0.814	3
Environmental Impact	0.814	3

Source: Field Work (2021)

4.3 Discussion of Results

From the survey carried out, it is impressive to know that all the influences of materials waste management on construction project delivery have high RII rating as it is above 0.60. The respondents ranked "Time overrun/Delay" with a very high RII ratings of 0.842 as the most important influences of materials waste management on construction project delivery. While "Insolvency as a result of loss" was the least with a rating of 0.702.

5.0 CONCLUSION AND RECOMMENDATION

Influences of materials waste management on construction project delivery were identified from literature survey and were used to obtain data. RII was used for data analysis with "Time overrun/Delay" identified as the most important influence of materials waste management on construction project delivery, while "Insolvency as a result of loss" was the least relevant influence of materials waste management on construction project delivery. Construction firms should be encouraged to integrate materials waste management in all aspect of project implementation so as to achieve sustainable project delivery.

REFERENCES

Adewumi, T. O. & Otoh, M. (2015). Evaluation of Causes of Construction Material Waste: Case of Rivers State, Nigeria. *Ethiopian Journal of Environmental Studies and Management*, 6(6), 746-753.

Ahmed, M. (2019). Evaluation of construction waste in Building projects in Abuja, Nigeria. Unpublished B.Sc. Project, Department of Building, Faculty of Environmental Design, Ahmadu Bello University, Zaria

Ameh, J. O. & Bode, D. E. (2013). Professionals' View of Material Wastage on Construction Sites and Cost Overruns. *International Journal of Organization, Technology and in Construction*. 5 (1), 343-352.

Construction Specification Institute, 2011. The CSI Project Delivery practice guide. New Jersey: John Wiley & Sons, Inc.

Gaigbane A. & Khandve, P.V (2015). Management for Construction Materials and Control of Construction Waste in Construction Industry: *International Journal of Engineering Research*. 2(5)136-138.

Kevin A.O. (2012). Evaluation of materials management strategies in the Nigerian construction industry. *International journal of management science and Business Research*.

Mohammed, A. (2019). Assessment of the influence of construction waste on sustainable projects delivery on construction sites in Abuja, Nigeria. Unpublished MSc Thesis, Department of Building, Faculty of Environmental Design, Ahmadu Bello University, Zaria.

Naper, I. (2012). Construction Waste Management. Retrieved from: http://www.wbdg.org/resources/cwmgmt.php

Ogbeifun, I.A & Mosselhi, O. (2013). Impact of building information modeling on just-in-time material Delivery. Department of Building, Civil and Environmental Engineering, Concordia University 1455 De Maisonneuve Blvd. West Montreal, Canada.

Patil A.R, Sirsat V. Patankar, S.V. (2013). Analysing material management techniques on construction project. *International Journal of Engineering and Innovative Technology*. (IJEIT) 3(4), 96-100.

Phi, N. T. & Chin, A. M. (2014). Factors Affecting Material Management in Building Construction Projects. *International journal of Scientific Engineering and Technological Research* 3 (10), 2133-2137.

Shani, A.D. & Digolo, C. K. (2014). Waste Management Models and their Applications on Construction Sites. *International Journal of Construction Engineering and Management*. 3 (3), 91-98.

Takim, R., & Akintoye, A. (2012, September). Performance indicators for successful construction project performance. *In 18th Annual ARCOM Conference* 2(1), 545-555.

Wahab, A. B. & Lawal, A. F. (2011). An Evaluation of Waste Control Measures in Construction Industry in Nigeria. *African Journal of Environmental Science and Technology*. 5 (3), 246-254.

WRAP UK, (2011). The net waste method – towards a new standard for measuring waste reduction.