

## THE OUTCOME OF POOR MATERIALS MANAGEMENT IN THE NIGERIAN CONSTRUCTION INDUSTRY

IDOWU ALBERT

Department of Building, Federal University of Technology Akure, Nigeria

Email: [idowualbertino@yahoo.com](mailto:idowualbertino@yahoo.com) , [alberti@futa.edu.ng](mailto:alberti@futa.edu.ng)

### Abstract

*Construction waste is a problem in the Nigerian construction industry which negatively affects the performance of many construction projects. Therefore, the main goal of this study was to investigate the outcome of poor materials management (PMM) on wastage of materials and quality of construction work in Nigeria. This study surveyed on-going building construction projects in Abuja, the Federal Capital Territory of Nigeria, using purposive non-probability sampling techniques. Data collection was based on the literature review, recording sheets with checklists with statements (Likert items) and responses to observe and document the outcome. The descriptive analysis of the data was based on computing the mode that describes the most frequently occurring outcome or outcome of PMM in construction projects. The results showed that PMM has a high outcome on materials waste and moderate outcome on the quality of building projects. Based on these findings, it can be concluded that effective management of materials in construction projects would reduce the material waste generation and increase quality of work on building projects.*

**Keywords: construction, materials flow, poor materials management, quality, waste.**

### 1.0 INTRODUCTION

As a result of the rapid growth of the construction industry, construction activities consume about 40% of the natural resources annually, and generate large quantities of waste. Half of this waste is excluded from the initial treatment and is disposed in landfills (Dajadian and Koch, 2014). Dajadian and Koch (2014) noted that construction materials waste is a global problem affecting both developed and developing countries. The Nigerian construction industry is among the main consumers of resources and energy (Dania, Kehinde and Bala, 2007), and reported to be generating unacceptable levels of materials waste (Wahab and Lawal, 2011). Ameh and Itodo (2013) observed that in every 100 houses built in Nigeria, there is sufficient waste materials to build another 10 houses.

Material waste according to Adewuyi and Odesola, (2015) are those that are lost in transit or off-site or even discarded without adding value to the project for which they were procured, including overproduction or left over from the newly constructed facility. The waste generated on construction sites can be physical or non-physical. The physical waste is from broken concrete, bricks, metals, packaging waste, and so on. While the non-physical waste are cost overruns and time delays in construction projects (Nagapanet *al.*, 2012).

Anderson and Thornback (2012) noted that the construction industry remains a key target for the global sustainability agenda, because the industry consumes a large portion of material resources extracted from nature and generates a huge portion of landfill waste (Ajayi *et al.*,

2016; and Bilal, *et al.*, 2016). Construction waste is a problem in the Nigerian construction industry which negatively affects the performance of many projects (Adewuyi and Otali, 2013). Therefore, the main goal of this study was to investigate the outcome of poor materials management (PMM) in the Nigerian construction industry, with a view to enhancing site materials management and reducing waste. Without identifying the outcome or the of PMM on construction project, it may be difficult to enhance site materials management and reduce waste in the Nigerian construction industry (Albert, Shakantu and Saidu, 2021). Therefore, the goal of this study is to investigate poor materials management on materials wastage and quality of work with a view to reduces waste and improve quality of construction work.

## **2.0 LITERATURE REVIEW**

### **2.1 Poor materials management**

Poor materials management can have a negative impact on cost as a result of excessive waste, quality and time of work, which will affect project delivery and profitability (Albert, Shakantu and Saidu, 2021; and Albert and Shakantu, 2018). One of the objectives of every contractor is to deliver a project on time while maximizing profit. However, the reverse is the case in many construction projects in Nigeria due to poor materials management which often increases waste generation and thereby reducing profitability (Aiyetan and Smallwood, 2013). In Nigeria, the control of materials during the construction process is mostly handled carelessly by the planning and purchasing departments, site supervisors and engineers, as well as the contractor's organisation and this has been posing serious problems to contractors in term of profit margin (Arijeloye and Akinradewo, 2016). Moreover, materials may be damaged or stolen during storage, unless special care is taken, delays and extra cost may be incurred and these reduce profitability (Patel, Pitroda and Bhavsar, 2015).

Materials flow on the Nigerian construction sites is marred by the poor materials management in the area of timing of materials arrival, lack of information for materials arriving at site, missing of materials, unavailability of storage space that makes it difficult to coordinate the storage requirements for the various sub-contractors and so forth (Donyavi and Flanagan, 2009). Therefore, there is need to address this problem by providing a clear theoretical understanding of the basic constructs and the related concepts of a materials management in the construction industry.

### **2.2 Outcome of poor materials management on Construction projects**

These are negative outcome of poor materials management in any construction projects as a result of excessive waste and quality of work which affect project delivery.

#### **2.2.1 The outcome on construction waste**

The material waste on construction sites results to cost overruns, because most managers of construction projects pay little attention to the effects of the generated or outcome of material waste on cost overruns (Ameh and Itodo, 2013). Concurrently, Osmani, Glass and Price (2008) agreed that construction materials waste is effectively generated throughout the construction project, from inception to completion with the initial stage accounting for a considerable amount. Therefore, outcome of poor materials management on materials wastage is as follows:

1. Increase quantities of waste;
2. Negatively impacts the waste management plan;
3. Negatively impacts the proposal for material waste recycling, recovering and disposal;
4. Leads to mixing of waste;
5. Makes it difficult to monitor the waste management plan;
6. Makes it difficult to manage waste related key performance indicators (KPI);
7. Makes it difficult to manage site waste management plan cost data;
8. Negates the effort for minimizing materials utilization;
9. Impinges on the need to assess and identify materials waste streams;
10. Makes it difficult to account for materials waste;
11. Makes it difficult to implement a materials waste management policy.

### **2.2.2 The outcome on quality of work**

Quality control in construction projects has to do with the quality of construction works at the required standard to obtain customer's satisfaction that will bring long-term competitiveness and business survival for the companies (Khalek, Aziz and Sharabash, 2016). However, poor materials management have a negative outcome on the quality of construction projects (Ameh and Itodo, 2013). Therefore, focusing on TQM, the outcome of poor materials management on quality of work can be summarized as:

- a) Quality of work is compromised because PMM leaves some materials spoiled;
- b) Impacts negatively on the quality of some of the materials on site;
- c) Negates the quality standard set up by management;
- d) Negates materials quality control;
- e) Makes it difficult to conduct materials quality audits.

### **2.3 Materials management in construction projects**

The management of materials in the Nigerian construction industry has not received much attention from the built environment practitioners and researchers (Donyavi and Flanagan, 2009). Therefore, there is need for much research work in the area of materials management. The successful completion and delivery of any construction project within time, budget, and quality, in accordance with specifications, and to the satisfaction of stakeholders is important for measuring project success. However, the complex nature of most construction projects today creates difficulties for even the best project managers (Duy, Ogunlana and Thi Xuan 2004). Therefore, most construction projects are challenged by materials shortages, delays in supply, price fluctuations, damage and wastage, and lack of storage space (Asmara, 2015). Thus, effective materials management is an important function for alleviating these challenges in construction (Albert, Shakantu and Ibrahim, 2018).

Managing materials is an issue on every construction site, as materials have to be moved from one place to another on the site, resulting in additional cost of manpower and machinery (Zeb *et al.*, 2015). Kazaz, Manisali and Ulubeyli (2008) noted that poor planning for construction materials and difficulties associated with site transportation are some of the factors that have a significant outcome on site productivity in both developed and developing countries.

Donyavi and Flanagan (2009) observed that materials management has not received much attention from researchers. Hence, Saidu and Shakantu (2016) asserted that poor materials

management leads to an increase in the total cost of building projects. It is therefore, important to manage all materials from the design stage to the construction stage of the project, as poor management of materials affects the overall performance of construction projects in terms of duration, budget, quality cost and productivity (Arijeloye and Akinradewo, 2016). In the same vein, Asmara (2015) reports that the management of materials should be considered during all the phases of the construction project and throughout the construction activities. Moreover, it is imperative for both the planning and the control aspect of materials to ensure that the right quality and quantity of materials are appropriately specified in a timely manner, obtained at a reasonable cost and that they are available when needed and also in order to avoid waste.

### **3.0 RESEARCH METHOD**

This study surveyed on-going building construction projects in Abuja, the Federal Capital Territory of Nigeria. The decision to use ongoing building construction projects was informed by the needs to identify poor materials management in the construction project. The choice of Abuja as the study location was based on its unique position as the city with the highest number of on-going building construction projects. The study used case studies approach. In this study, direct observation in the in-depth case studies provided an understanding of the poor materials management on construction sites.

The population for this study is building construction sites within Abuja, the Federal Capital Territory of Nigerian, because it is one of the metropolitan cities in Nigeria that has the highest population of the built environment professionals in the country; and it has many on-going building construction projects. From this population, a sample of ten building projects were selected, with a value of 100 million Naira and above, using purposive non-probability sampling techniques. The rationale for the purposive non-probability (typical case sampling selection) is that building construction projects of this value and above are typically likely to have poor materials management compared with projects of less value.

For data collection, based on the literature review, recording sheets with checklists was pre-set with statements (Likert items) and responses to observe and document the outcome of poor materials management related to material waste. Between November, 2020 to February, 2021, the researcher visited each of these project sites and used covert observation (no one knows they are being observed and the observer is concealed or embedded research) to observe and record people's behaviour, actions and interactions. The observation was done for an average period of 4 hours for the 4 months period.

Recording sheet 1 consists of 11 statements (Likert items) on the outcome of poor materials management on materials waste. The observer rated quantities of waste, waste management plan, waste recycling and disposal, mixing, KPI, costs, utilization, waste streams, account waste, waste policy in terms of materials usage onsite, loading/off-loading of materials from procurement, storages, and materials handling and movement on site. Recording sheet 2 consists of five statements (Likert items) on the outcome of PMM on quality. The observer rated spoiled materials, onsite materials quality, standards, control, and audits in terms of the materials usage onsite, loading/offloading of materials from procurement, storages, as well as materials handling and movement on site.

The Statistical Package for the Social Sciences (SPSS) version 23 was used to conduct descriptive analysis of the data computing the mode that describes the most frequently occurring outcome or outcome of poor materials management in construction (Field, 2021). To measure the central tendency of the outcome of poor materials management on materials waste, the statements (Likert items) were rated on an ordinal three-point Likert scale.

#### 4.0 RESULTS

**Table4.1 outcome of poor materials management on materials waste**

STATEMENT	Case studies 3= High; 2=Moderate; 1=Low										Modal value
	Case Study 1	Case Study 2	Case Study 3	Case Study 4	Case Study 5	Case Study 6	Case Study 7	Case Study 8	Case Study 9	Case Study 10	
PMM increases quantities of waste	3	1	1	2	2	3	3	3	3	2	3
PMM negatively impacts the waste management plan	3	1	1	1	1	3	3	2	3	2	1 and 3
PMM negatively impacts the proposal for material waste recycling, recovering and disposal	2	2	2	2	2	2	3	3	3	2	2
PMM leads to mixing of waste	2	1	1	1	1	3	3	3	3	1	1
PMM makes it difficult to monitor the waste management plan	2	1	2	2	2	3	3	2	3	2	2

PMM makes it difficult to manage waste related key performance indicators (KPI)	2	1	1	3	2	3	2	3	3	2	2 and 3
PMM makes it difficult to manage site waste management plan cost data	3	1	1	1	3	3	2	3	2	2	3
PMM negates the effort for minimizing materials utilization	2	2	2	2	2	2	2	2	2	2	2
PMM impinges on the need to assess and identify materials waste streams	3	3	3	1	1	3	3	2	2	1	3
PMM makes it difficult to account for materials waste	3	2	2	2	2	3	3	3	3	2	2 and 3
PMM makes it difficult to implement a materials waste	3	2	1	3	2	3	3	3	3	2	3

managem nt policy											
Total											3

Table 4.1 shows from the total modal value that a value of 3 demonstrates that poor materials management was high on material waste in the construction industry in Nigeria. This means that poor materials management exacerbates the problem of waste of materials on sites.

The results also show that poor materials management increases quantity of materials waste. This was supported by Saidu and Shakantu (2016) that imprudent management of material does increase in wastage on construction sites which also result increase cost overrun for a project. More so, material waste has significant impact on the cost of a project as well as an adverse impact on the environment (Nagapan *et al.*, 2012). The study found that a waste management plan has a high negative outcome on construction site materials wastage.

Regarding monitoring of the waste management plan, it was observed that negatively impacts the waste management plan. This aligns with the findings of Dania, Kehinde and Bala (2007) that site materials waste management is very poor and has much room for improvement. Mixing of waste also had a negative outcome on the construction sites. This corroborates the report of Matt (2016) that mixing waste for disposal makes it almost impossible to meet the organization’s waste management targets. The mixing of waste on sites should be avoided as it becomes difficult to separate it at a later date. Efforts at minimizing materials utilization, site waste management plan cost data and a waste management policy had a moderate to high on control of materials wastage.

From the results in Table 4.1, it is evident that waste related key performance indicators have a high outcome on materials waste on construction sites. This means that the management teams selected the right KPI for the construction companies. These findings support a study by Chan and Chan (2004), which established that in order to identify the ‘real’ success factors of construction projects, it is important to identify parameters (Key performance indicators) for benchmarking projects at the project selection phase in order to achieve good project performance. Poor materials management was high on materials waste streams because waste is not sorted into specific streams, from its source through to recovery, recycling or disposal process on construction projects. This implies that poor materials management has a negative outcome on construction projects. This contradicts a report by Towing (1998) that recycling and controlled management of construction waste streams would save land and create better opportunities for handling other kinds of waste.

Therefore, managing construction waste means get rid of waste where possible, reducing waste where feasible, and reusing materials which might become waste. So, introducing a site waste management plan before the commencement of construction project would help to achieve effective waste management.

**Table 4.2 outcome of poor materials management on quality**

STATEMENT	Case studies 3= High; 2=Moderate; 1=Low										Modal value
	Case Study 1	Case Study 2	Case Study 3	Case Study 4	Case Study 5	Case Study 6	Case Study 7	Case Study 8	Case Study 9	Case Study 10	
Quality of work is compromised because PMM leaves some materials spoiled	3	1	1	1	2	3	3	2	2	1	1
PMM impacts negatively on the quality of some of the materials on site	3	1	1	2	3	2	2	2	2	1	2
PMM negates the quality standard set up by management	2	2	2	2	2	2	2	2	2	2	2
PMM negates materials quality control	2	2	2	3	3	3	3	3	3	2	3
PMM makes it difficult to conduct materials quality audits	2	2	2	3	2	3	3	3	2	2	2
<b>Total</b>											<b>2</b>

Table 4.2 has an overall modal value that demonstrates poor materials management has a moderate outcome on quality in the construction industry in Nigeria.



Based on the results, poor materials management has a huge negative impact on materials quality control on construction projects. This finding corroborates a study by Ameh and Itodo (2013) as highlighted in section 2.2.2 of this study.

Moreover, the study observed that the quality of work is compromised because poor materials management leaves some materials spoiled. This contradicts a report by Khalek, Aziz, and Sharabash (2016) as highlighted in section 2.2.2 of this study. Poor materials management also negatively impacts the quality of some of the materials on site. However, poor materials management has a moderate impact on standards set up by management. This means that a substantial number of organisations compromised quality of building materials during the construction stage. This supports a study by Ogunde *et al.* (2017) found that the Nigerian building construction industry patently compromise the quality and specifications of materials for projects. Therefore, an improved practice of project management delivery system is required so as to curtail these performance breaches. Table 4.2 also shows that poor materials management made it very difficult to conduct materials quality audits on construction projects. To achieve a successful materials quality audit, first, the correct procedures specified in the quality plan should be followed, and secondly, they should be followed consistently (Oakland, 2014; Dale, Van Der Wiele and Van Iwaarden, 2007; and Juran, 1999).

## **5.0 CONCLUSION AND RECOMMENDATIONS**

This study examined the outcome of poor materials management on wastage of materials and quality of construction projects in the Nigerian construction industry.

The study showed that poor materials management was high on wastage of materials on construction project, with the following: poor materials management makes it difficult to implement materials waste management policy; to account for materials waste; to manage site waste management plan cost data; to manage waste-related KPIs; negatively impacts the waste management plan and increases quantities of waste.

With regards to quality of construction work, it was found that poor materials management has a moderate outcome on the quality of building projects in Abuja, with the following statements: poor materials management impacts negatively on the quality of some of the materials on site; negates the quality standard set up by management and makes it difficult to conduct materials quality audits.

Based on these findings, it can be concluded that effective management of materials in construction projects would reduce the material waste generation and increase the quality of work on construction projects.

Therefore, the study recommends that construction stakeholders should be well informed on the outcome of poor materials management. The Nigerian construction industry should collaborate with government agencies to develop guidelines for preparing a waste management plan for the construction industry and ensure that top management adopts the culture of training and developing their staff about new managerial tools and techniques for site materials management.

## REFERENCES

- Adewuyi, T.O. &Otali, M., (2013). Evaluation of Causes of Construction Material Waste: Case of River State, Nigeria. *Ethiopian Journal of Environmental Studies and Management*, 6(6), 746-753.
- Adewuyi, T.O. &Odesola, I.A., (2015). Factors affecting Material Waste on Construction Sites in Nigeria. *Journal of Engineering and Technology (JET)*, 6(1), 82-99.
- Aiyetan, O. & Smallwood, J., (2013). Materials Management and Waste Minimisation on Construction Sites in Lagos State, Nigeria. In *Proceedings of the 4th International Conference on Engineering, Project, and Production Management (EPPM)*, 1161-1172.
- Ajayi, S.O., Oyedele, L.O., Akinade, O.O., Bilal, M., Owolabi, H.A., Alaka, H.A. & Kadiri, K.O., (2016). Reducing waste to landfill: A need for cultural change in the UK construction Industry. *Journal of Building Engineering*, 5, 185-193.
- Albert, I., Shakantu, W. & Saidu, I., (2021). The effect of poor materials management in the construction industry: A case study of Abuja, Nigeria. *Acta Structillia*, 28(1), 142-167.
- Albert, I. &Shakantu, W., (2018). An Appraisal of Control of Construction Materials in the Nigerian Building Industry: A Case Study of Abuja, Nigeria. *Civil Engineering Research Journal* 6(4), 001-006.
- Albert, I., Shakantu, W. & Ibrahim, K., (2018). Impact of Materials Management Practices in the Nigerian Building Construction industry. *Journal of Construction Project Management and Innovation*, 8(1), 1789-1796.
- Ameh, J.O. &Itodo, E.D., (2013). Professionals' views of material wastage on construction sites. *Organization, Technology and Management in Construction. An International Journal*, 5(1), 747-757.
- Anderson, J. & Thornback, J., (2012). A guide to understanding the embodied impacts of construction products. *Construction Products Association*, 1-48.
- Arijeloye, B.T. &Akinradewo, F.O., (2016). Assessment of materials management on building projects in Ondo State, Nigeria. *World Scientific News*, 55, 168-185.
- Asmara, S., (2015). *Managing and Minimizing Wastage of Construction Materials on Selected Public Building Projects in Addis Ababa*. Unpublished Master thesis at the Addis Abab University.
- Bilal, M., Oyedele, L.O., Akinade, O.O., Ajayi, S.O., Alaka, H.A., Owolabi, H.A., ... Bello, S.A., (2016). Big data architecture for construction waste analytics (CWA): A conceptual framework. *Journal of Building Engineering* 6, 144-156.
- Chan, A.P. & Chan, A.P., (2004). Key performance indicators for measuring construction success. *Benchmarking: an international journal*, 11(2), 203-221.
- Dale, B.G., Van Der Wiele, T. and Van Iwaarden, J., (2007). *Managing quality*. John Wiley & Sons.
- Dajadian, S.A. & Koch, D.C., (2014). Waste management models and their applications on construction sites. *International Journal of Construction Engineering and Management*, 3(3), 91-98.
- Dania, A.A., Kehinde, J.O. and Bala, K., (2007). A study of construction material waste management practices by construction firms in Nigeria. In *Proceedings of the 3rd Scottish Conference for Postgraduate Researchers of the Built and Natural Environment, Glasgow*, 121-129.

- Donyavi, S. & Flanagan, R., (2009). The impact of effective material management on construction site performance for small and medium sized construction enterprises. In *Proceedings of the 25th Annual ARCOM Conference, Nottingham, UK*, 11-20.
- Duy Nguyen, L., Ogunlana, S.O. & Thi Xuan Lan, D., (2004). A study on project success factors in large construction projects in Vietnam. *Engineering, Construction and Architectural Management*, 11(6), 404-413.
- Juran, J.M., (1999). How to think about quality. *JM Juran, AB Godfrey, RE Hoogstoel, and EG, Schilling (Eds.): Quality-Control Handbook. New York: McGraw-Hill.*
- Kazaz, A., Manisali, E. & Ulubeyli, S., (2008). Effect of basic motivational factors on construction workforce productivity in Turkey. *Journal of civil engineering and management*, 14(2), 95-106.
- Matt, C., (2016). Waste Management on Construction site. *International Institute of Risk and Safety Management (iirsm)*. [www.iirsm.org](http://www.iirsm.org)
- Nagapan, S., Rahman, I.A. & Asmi, A., (2012). Factors contributing to physical and non-physical waste generation in construction industry. *International Journal of Advances in Applied Sciences*, 1(1), 1-10.
- Nagapan, S., Rahman, I.A., Asmi, A., Memon, A.H. & Latif, I., (2012). Issues on construction waste: The need for sustainable waste management. In 2012 IEEE Colloquium on Humanities, Science and Engineering (CHUSER), 325-330.
- Oakland, J.S., (2014). *Total quality management and operational excellence: text with cases*. Routledge.
- Ogunde, A., Olaolu, O., Afolabi, A.O., Owolabi, J. & Ojelabi, R., (2017). Challenges confronting construction project management system for sustainable construction in developing countries: Professionals perspectives (a case study of Nigeria). *Journal of Building Performance*, 8(1), 1-11.
- Osmani, M., Glass, J. & Price, A.D., (2008). Architects' perspectives on construction waste reduction by design. *Waste Management*, 28(7), 1147-1158.
- Patel, H., Pitroda, J. & Bhavsar, J.J., (2015). Analysis of factor affecting material Management and Inventory Management: survey of construction firms in Gujarat region of india. *International Journal of Advanced Research in Engineering, Science and Management*. 1-6.
- Saidu, I. & Shakantu, W., (2016). The contributions of construction material waste to project cost overruns in Abuja, Nigeria: review article. *Acta Structilia: Journal for the Physical and Development Sciences*, 23(1), 99-113.
- Towing, M., 1998. Management of Construction & Demolition Waste Streams.
- 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.
- Zeb, A., Malik, S., Nauman, S., Hanif, H. & Amin, O.S., (2015). Factors Affecting Material Procurement, Supply and Management in Building Projects of Pakistan: A Contractor's Perspective. In *International Conference on Innovations in Civil and Structural Engineering*, held in Istanbul, Turkey, 170-175.