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WASTE MANAGEMENT PRACTICES IN CONSTRUCTION FIRMS: A CASE STUDY OF TRIACTA NIGERIA LTD IN BAUCHI, NIGERIA

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ABSTRACT

This study investigates the impact of construction firms' waste management practices. It focuses on Triacta Nigeria Ltd in Bauchi. The study utilised a survey research design and collected data from 84 permanent staff members to understand their perceptions and experiences related to waste management practices. The findings reveal that significant types of construction

Introduction

Horsley (2018) and Bovea & Powell (2019) highlight the significant environmental impacts of the construction industry, which generates up to 35% of the total waste stream globally. Dania (2018) highlights the need for sustainable waste management practices to reduce the environmental impact of construction activities and contribute to the overall sustainability of the industry. The US Green Building Council (2017) states that construction and demolition waste accounts for up to 30% of the total waste output in the United States, amounting to approximately 136 million tons per annum. Faniran & Caban (2016) highlight the challenges of implementing sustainable waste

waste generated include demolition materials, excavated earth, and unused materials. While certain recycling techniques exist, their efficiency varies, emphasising the need for improved policy enforcement, trash segregation procedures, and staff training. Key challenges identified include resistance to change, logistical complexities, inadequate infrastructure, and high costs, all of which hinder effective recycling adoption. Based on these findings, the study recommends improving policy implementation, enhancing training programmes, and investing in infrastructure to optimize waste management and promote organisational sustainability. This study offers important insights for stakeholders aiming to improve construction waste management practices.

Keywords: Construction Firms; Construction Waste; Recycling Practices; Sustainability; Waste Management

management practices in developing countries, such as lack of awareness, inadequate infrastructure, and financial constraints. Addressing these challenges and promoting the adoption of standard waste management practices is crucial for mitigating the industry's environmental impact and ensuring long-term sustainability. Balancing environmental concerns with infrastructure development is essential for the construction industry's long-term sustainability.

Windapo & Oladapo (2019) highlight the significant waste generated by the construction industry in Nigeria, which contributes 3-5% to the country's GDP. However, waste management is often inadequate, with improper disposal methods like open dumping or burning being common. Akinpelu (2016) suggests that waste materials from construction projects account for over 60% of total production costs. Recycling has emerged as a viable solution to address this issue, with up to 90% of waste generated on construction sites being recyclable. In Bauchi, the capital city of Bauchi State, the construction industry plays a significant role in the local economy. Dauda & Osita (2023) emphasize the importance of standard waste management practices, such as waste segregation, recycling, and disposal, in mitigating environmental and public health impacts. Ekanayake & Ofori

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(2016) and Babatunde et al. (2018) highlight the importance of implementing these practices, including waste management plans, recycling techniques, and stakeholder involvement. However, the implementation of these practices in Bauchi has not been extensively researched. Understanding these practices and their potential impact on the local environment and public health is crucial for improving the sustainability of the construction industry in the region.

The purpose of this study is to explore the influence of standard waste management methods on building sites in Bauchi, utilising Triacta Nigeria Ltd as a case study, with the following objectives: i. Identify waste types generated by Triacta Nigeria Ltd Bauchi, ii. Examine current recycling practices in the company, and iii. Identify challenges and strategies for improving construction waste management.

This study's findings will add to the existing literature on sustainable construction waste management and make recommendations for improving waste management practices in Bauchi's building industry.

CONCEPT OF WASTE MANAGEMENT

Waste management is a critical aspect of sustainable development, as it encompasses the collection, transportation, treatment, and disposal or recovery of waste materials generated from various human activities, including construction. The fundamental concept of effective waste management revolves around the hierarchical approach known as the waste management hierarchy or the 3Rs (Reduce, Reuse, Recycle) (Esa et al., 2017).

Reduce

The primary goal of waste management is to minimize the generation of waste at the source through efficient design, process optimization, and the use of sustainable materials (Ajayi et al., 2017). Reduction of waste can be achieved by improving construction techniques, reducing material use, and implementing lean construction practices (Osmani et al., 2008).

Reuse

Reusing construction materials and components involves the direct utilization of waste materials in their original or slightly modified form for

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the same or a different purpose (Addis, 2006). Reuse strategies can include the repurposing of building elements, the refurbishment of used materials, and the implementation of deconstruction and salvage practices (Ajayi et al., 2017).

Recycle

Recycling involves the processing of waste materials to create new products or to recover valuable resources (Akhtar & Sarmah, 2018). Construction waste recycling encompasses the separation, collection, and reprocessing of materials such as concrete, metals, plastics, and wood to be used in new construction projects or other applications (Solís-Guzmán et al., 2009).

The concept of waste management also considers the appropriate disposal of waste materials that cannot be effectively reduced, reused, or recycled. This includes the use of landfills, incineration, or other waste-to-energy technologies, with a focus on minimizing the environmental impact of these disposal methods (Tam, 2008).

Effective waste management strategies integrate these principles of the waste management hierarchy, as well as consider the specific challenges and opportunities within the construction industry. This holistic approach aims to maximize resource efficiency, minimize environmental impacts, and promote the transition towards a circular economy in the construction sector (Akhtar & Sarmah, 2018).

Key elements of a comprehensive construction waste management approach

Waste Stream Analysis and Characterization

Solís-Guzmán et al. (2009) research on waste reduction in construction waste emphasizes the importance of analysing the composition, volume, and sources of waste. This process helps develop strategies for waste reduction, reuse, and recycling. By understanding the waste stream, stakeholders can make informed decisions about the most suitable waste management techniques and technologies. For instance, if the waste stream is dominated by recyclable materials, efficient sorting and recycling

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processes can be implemented, while strategies for on-site composting or biofuel production may be more appropriate.

Stakeholder Engagement and Collaboration

Ajayi et al. (2015) highlight the importance of stakeholder engagement in successful construction waste management. This approach involves the active involvement of various stakeholders, including clients, designers, contractors, waste management service providers, and regulatory authorities. By involving all parties, clients can set clear waste reduction targets and incorporate sustainable practices into their project requirements. Contractors optimize waste collection, sorting, and transportation processes, while regulatory authorities provide guidance and enforce policies encouraging sustainable waste management practices. This holistic approach helps overcome siloed mentalities and promotes a circular economy, ultimately reducing construction waste and promoting sustainable practices.

Policy and Regulatory Frameworks

Tam et al. (2007) highlight the importance of policy and regulatory frameworks in promoting sustainable waste management practices in the construction industry. These frameworks include waste disposal bans, recycling mandates, and landfill diversion targets. Waste disposal bans prohibit landfilling of certain waste types while recycling mandates and landfill diversion targets encourage efficient waste management strategies. Extended Producer Responsibility (EPR) schemes hold manufacturers and producers responsible for end-of-life management, incentivizing recyclability and promoting the circular economy. By aligning with these frameworks, stakeholders can contribute to resource conservation and environmental protection, contributing to a more sustainable and environmentally friendly construction industry.

Concept of Construction

Construction waste, a significant contributor to socio-economic development, is a major polluter of the environment due to its exploitation of natural non-renewable resources and generation of waste. According to

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Watuka and Aligula (2003), the Construction industry generates a large amount of waste, with 200 to 300 million tons produced annually in EC countries, equivalent to a 400 km^2 area covered with demolition debris one meter high. Pieterson and Fraay (1998) reveal that construction waste is generated in various sectors, including the Green Building Council (2001), which estimates that in the United States alone, 136 million tonnes of construction waste are generated annually.

Construction Waste Generation

Construction projects generate waste throughout their lifecycle, which can be attributed to factors across five main phases; design, procurement, materials handling, construction/renovation, and demolition (Lawal, 2019). Decisions made during the design process, the procurement of materials and resources, improper materials management on-site, construction/renovation activities, and the demolition of existing structures can all contribute to the production of construction waste.

Design

Carelessness and oversights at the design stage can lead to excessive waste generation in several ways. Poorly conceived designs that require excessive cutting of materials can result in cutting waste. Designs that specify non-standard or custom formwork can negatively impact the constructability and assembly of building components. Additionally, planning and detailing errors arising from time constraints can cause variations and changes during construction, requiring the input of additional materials to address these issues.

Procurement

The procurement phase can contribute to waste generation in a few key ways. Errors in material take-offs and incomplete detailing can lead to over-ordering, where more materials are purchased than what is actually needed, particularly for renovation projects that require smaller quantities. Additionally, a lack of care during the transportation and handling of materials can result in damage to the materials, thereby creating waste.

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Material Handling

The lack of sufficient and confined storage space on construction sites can cause significant storage problems for materials. As a result, materials may be improperly stacked or stored, leading to issues like rusting of steel, damage to formwork, and premature aging of other building components. This improper storage and handling of materials on-site ultimately results in waste generation.

Construction/Renovation

During the actual construction or renovation work on-site, several factors can lead to waste generation. Inefficient construction techniques and practices, such as incorrect cutting or assembling of materials, can result in excessive off-cuts and waste. Rework required due to errors or defects in the work performed can also necessitate the input of additional materials, creating further waste. Additionally, the use of damaged or malfunctioning equipment on-site can negatively impact the quality of work and contribute to waste.

Demolition Works

The demolition phase at the end of a construction project's lifecycle is a major source of waste generation. During the demolition of existing structures, large volumes of various building materials and components are broken down and discarded. This includes concrete, masonry, metals, wood, and other materials that made up the original structure.

The demolition process itself, if not carried out carefully and with the intent of salvaging and reusing materials, can lead to the unnecessary destruction and wastage of many reusable construction components. Additionally, hazardous materials present in older buildings may require special handling and disposal, further contributing to the waste stream.

Types of Construction Wastes

Concrete waste, timber waste, masonry waste, metal waste, packaging waste, hazardous waste, and other construction waste are all part of the diverse range of waste generated during construction projects. Concrete waste includes excess concrete mixes, returned loads, and the breaking up

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of hardened concrete. Masonry waste includes off-cuts, broken or damaged bricks, blocks, and tiles. Timber waste includes offcuts, unused, and damaged timber products from framing, formwork, scaffolding, and wooden packaging. Metal waste includes scrap metals from various construction activities. Packaging waste includes materials used for transporting and protecting construction supplies. Hazardous waste includes solvents, paints, adhesives, contaminated soils, and asbestos-containing materials. Other types of construction waste include glass, insulation materials, electrical and electronic waste, and miscellaneous items.

Management of Waste Materials

Construction waste management is a critical aspect of sustainable construction practices. Key aspects include waste minimization, waste segregation and storage, waste reuse and recycling, waste disposal, waste tracking and documentation, and waste recycling. Tam (2018) emphasizes the importance of designing standardized modular components, optimizing procurement and inventory management, and improving construction techniques to minimize waste. Yuan (2013) and Esa (2017) emphasize the importance of segregating waste into distinct categories for easier handling and processing. Ajayi et al. (2015) highlight the need for innovative recycling solutions and the use of construction and demolition waste in road construction. Waste disposal involves the proper disposal of non-recyclable or hazardous materials in accordance with local regulations and environmental standards (Duan et al., 2015). Waste tracking and documentation involve comprehensive record-keeping systems to monitor waste types, quantities, and destinations (Yuan, 2013), and analysing waste data to identify areas for improvement and support future project planning (Ajayi et al., 2015).

In summary, construction sites face several challenges in managing waste generated during projects. One major issue is the lack of proper onsite waste segregation, which can lead to cross-contamination of waste streams. Factors contributing to this problem include insufficient storage space, unclear signage, and inadequate worker training. Limited availability and accessibility of waste recycling facilities, particularly for specialized

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construction materials, also hinder recycling initiatives. Improper waste disposal is another concern, with workers resorting to illegal dumping or inappropriate disposal methods due to a lack of awareness, inconvenient waste management processes, or cost considerations. Inadequate waste tracking and documentation are another common challenge. The limited integration of waste management planning during the design and pre-construction phases can create barriers to implementing effective waste management practices. The lack of collaboration between different stakeholders can further exacerbate these challenges. This study aims to close the gap by researching the impact of standard waste management practices on construction sites in Bauchi using Triacta Nigeria Ltd as a case organisation.

RESEARCH METHODOLOGY

This section presents the methodology used to investigate the impact of standard waste management practices on construction sites. It outlines the research design, unit of analysis, population of the study, sample and sampling technique, sample size, data collection instruments and procedures, validation of instruments, variables and measurement, and the method of data analysis.

Research Design

The research design employed in this study was a survey research design. This design allows for the systematic collection and analysis of data to describe the characteristics and relationships of variables (Broadview 2017). It will provide a comprehensive understanding of the impact of standard waste management practices on construction sites.

Unit of Analysis

The unit of analysis in this study were was staff at Triacta Nigeria Ltd Bauchi Unit. By focusing on permanent workers, the study captured their perceptions, experiences, and satisfaction levels related to standard waste management in their construction sites.

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Population of the Study

The population of the study comprised all the permanent staff of Triacta Bauchi Branch, the company has a total of 104 permanent staff in Bauchi also known as Card holders (Triacta Nigeria Ltd, 2024).

Sample and Sampling Technique

Due to the large population size, a sampling technique is necessary to select a representative sample. The study used a Krejcie and Morgan (1970) sampling technique.

Sample Size

The sample size was determined using a sample size Krejcie & Morgan (1970) formula for sample size,

Formula for determining sample size

$$s = X^2NP(1-P) \div d^2(N-1) + X^2P(1-P)$$

s = required sample size.

X^2 = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841).

N = the population size.

P = the population proportion (assumed to be .50 since this would provide the maximum sample size).

d = the degree of accuracy expressed as a proportion (.05).

Source: Krejcie & Morgan, 1970

s = 3.841 x 104 x 0.5(1-0.5) / (0.05)^2(104-1) + 3.841 x 0.5(1-0.5)

s = 83.75

Rounding up, the required sample size using the Krejcie and Morgan (1970) technique for a population of 104 is 84. Therefore, the sample size of this study will be 84 card-holding staff of Triacta Nigeria Ltd Bauchi unit.

Data collection instruments and procedures

The study used both primary and secondary data, the primary data collection for this study was a structured questionnaire. The questionnaire consisted of items related to standard waste management practices on

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construction sites. The questionnaires were administered to the selected participants at Tricata Nigeria Ltd Bauchi branch. The collection process was conducted by self-administering the questionnaires on a drop-and-pick method to allow the respondents to attend to the questionnaires at a convenient time without interrupting their office duties.
Secondary data were gathered from academic journals, government reports, and industry publications, providing context for waste management practices in the construction sector. This mixed-method approach enhanced the analysis and informed recommendations for improving waste management on construction sites.

Method of Data Analysis
The collected data were analyzed using appropriate statistical techniques. Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to summarize the data using a statistical software, Statistical Package for the Social Sciences, SPSS version 22.

DATA ANALYSIS, INTERPRETATION, AND DISCUSSION
This section presents the results obtained by the researcher, which include the response rate, biodata information, descriptive analysis, interpretation, and discussion of the findings. A total of 84 questionnaires were administered by the researcher to the respondents.

Response Rate
Table 1: Response Rate

Questionnaires	Frequency	Percentage (%)
Questionnaires not properly completed	4	5
Questionnaires not returned	6	8
Questionnaires properly completed	74	88
Total	**84**	**100**

Source: Field Data, 2024

Table 1 shows that a total of 84 questionnaires were distributed to the respondents. Out of these, 74 questionnaires were properly completed and

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returned, representing a response rate of 88.1%. Four questionnaires were not properly completed, which accounted for 4.8% of the total distributed, and six questionnaires were not returned, accounting for 7.1%. This high response rate of properly completed questionnaires indicates a strong participation level among the respondents, providing a reliable data set for analysis.

Demographic Analysis of the Respondents

Table 2: Gender Distribution of Respondents

Gender	Frequency	Percentage (%)
Male	70	95
Female	4	5
Total	**74**	**100**

Source: Field Data, 2024

From Table 2, it can be observed that out of the 74 respondents, 70 were male, making up 94.6% of the total respondents, while 4 were female, representing 5.4%. This distribution highlights a significant gender disparity among the respondents, with males being the predominant group.

Table 3: Years of Working Experience of Respondents

Years of Working Experience	Frequency	Percentage (%)
1 – 10	66	89
11 – 20	6	8
21 and above	2	3
Total	**74**	**100**

Source: Field Data, 2024

From Table 3, it can be observed that the majority of respondents, 66 out of 74 (89%), have 1 to 10 years of working experience. This is followed by 6 respondents (8%) with 11 to 20 years of experience, and only 2 respondents (3%) have 21 years of working experience or more. This distribution indicates that most of the respondents are relatively early in their careers.

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Table 4: Educational Qualifications of Respondents

Educational Qualification	Frequency	Percentage (%)
O'level/SSCE	10	14
Diploma/NCE/A level	19	26
HND/B.Sc.	35	47
Others	10	14
Total	**74**	**100**

Source: Field Data, 2024

From Table 4, it can be observed that out of the 74 respondents: 10 respondents (14%) have O'level/SSCE qualifications. 19 respondents (26%) have Diploma/NCE/A level qualifications. 35 respondents (47%) have HND/B.Sc. Qualifications. 10 respondents (14%) have other qualifications. This reflects a slightly higher number of respondents with HND/B.Sc. Qualifications.

Data Analysis

Decision rule: if the mean score is below 3.0 it will be rejected, if equal or above 3.0 it will be accepted.

Table 5: Wastes Generated Construction Industry

SN	Variable	SD	D	N	A	SA	MEAN	Std. Dv.	Rank
1	Materials that were purchased but not used in the project, contributing to waste.	3	6	15	23	27	4.03	0.85	1st
2	Materials removed during demolition, such as concrete, bricks, wood, and metals.	5	7	10	22	30	4.02	0.9	2nd
3	Leftover paint, sealants, and other	4	7	13	24	26	4.01	0.87	3rd

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	liquid construction materials.								
4	Earth is removed during excavation activities, which can include contaminated soil.	4	9	12	20	29	4	0.88	4th
5	Packaging waste from deliveries of construction materials.	5	10	11	21	27	3.93	0.89	5th
6	Plastic materials used in construction, such as pipes, fittings, and packaging.	6	8	14	18	28	3.9	0.92	6th
7	Waste generated from workers' personal protective equipment.	7	9	12	22	24	3.85	0.94	7th

Source: Field Data, 2024

The survey results indicate that demolition materials, such as concrete, bricks, wood, and metals, are a significant waste type, with a mean score of 4.02. Earth removed during excavation activities, including contaminated soil, is a major concern, with a mean score of 4.00. Unused materials, such as pipes, fittings, and packaging, are also of significant concern. Plastic materials used in construction, such as paint, sealants, and other liquid materials, are also of significant concern. Leftover paint, sealants, and other liquid materials are also of significant concern. Packaging waste from deliveries has a mean rating of 3.93, with some differences in respondents' opinions on its impact. Workers' personal protective equipment waste has the lowest mean score of 3.85, with the highest level of variability in responses, indicating differing opinions on its significance. The data highlights the variability in how strongly different types of waste are perceived, with some receiving more consistent concern than others.

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Table 6: Recycling practice

SN	Variable	SD	D	N	A	SA	MEAN	Std. Dv.	Rank
1	Availability of dedicated recycling bins and facilities.	7	8	18	22	19	3.72	1.02	1st
2	There is an establishment of waste segregation procedures.	6	10	22	19	17	3.6	0.98	2nd
3	We have an existing written recycling policy on our construction sites.	8	12	20	18	16	3.52	1.05	3rd
4	Monitoring and evaluation of recycling efforts.	8	12	19	18	17	3.5	1.03	4th
5	Regular training for staff on recycling practices.	9	14	21	16	14	3.42	1.12	5th
6	Engagement with external recycling service providers.	10	15	20	14	15	3.39	1.08	6th
7	Reporting and feedback mechanisms on recycling performance.	11	13	21	16	13	3.38	1.1	7th

Source: Field Data, 2024

Triacta Plc Bauchi has implemented recycling practices for construction waste, but there is room for improvement. A written recycling policy is present, but its enforcement may not be uniform across all sites. Waste segregation procedures are somewhat established, but opinions vary on their effectiveness. The availability of dedicated recycling bins and facilities is better perceived, but their accessibility and adequacy could be improved. Regular staff training on recycling practices is provided, but may not be sufficient or comprehensive. Engagement with external recycling service providers is moderate, and monitoring and evaluation of recycling efforts is some level of oversight. Reporting and feedback mechanisms on recycling performance are less emphasised, indicating a need for better systems.

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Table 7: Challenges Hindering the Widespread Adoption of Construction Waste Recycling

SN	Variable	SD	D	N	A	SA	MEAN	Std. Dv.	Rank
1	High costs associated with recycling technology and	5	9	12	20	28	3.83	0.96	1st
2	Sorting and transporting construction waste to recycling facilities can be logistically complex and costly.	5	8	12	20	29	3.82	0.94	2nd
3	Inadequate infrastructure for waste collection and recycling.	7	11	14	21	21	3.8	0.99	3rd
4	Difficulty in separating and sorting mixed construction waste.	6	10	16	22	20	3.77	1.01	4th
5	Resistance to change within the industry.	6	9	15	23	21	3.75	0.98	5th
6	Construction professionals perceive recycling processes as time-consuming to project schedules.	7	10	14	19	24	3.68	1.02	6th
7	Many construction professionals are not fully aware of the benefits of recycling construction waste.	8	12	13	22	19	3.55	1.08	7th

Source: Field Data, 2024

The mean score of construction waste recycling is significant, with a score of 3.75 indicating resistance to change. The perception of recycling

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processes as time-consuming and logistically complex is also a significant barrier. The lack of awareness about the benefits of recycling construction waste is another significant issue. The practical challenges of separating and sorting mixed construction waste are also significant. Insufficient infrastructure for waste collection and recycling is a significant deficiency, with a mean score of 3.80. The high costs associated with recycling technology and processes further limit the widespread implementation of recycling practices.

Discussion of Result

The survey results indicate that demolition materials, such as concrete, bricks, wood, and metals, contribute significantly to waste, with a mean score of 4.02. This aligns with Garbach and DeDeyn (2020) which emphasises the need for effective management strategies. Subhasish (2019) highlights the challenges of excavation waste, including contaminated soil, and the variability in management practices. Unused materials, such as pipes and packaging, also contribute significantly, with a mean score of 4.03. Kumar and Singh (2021) highlight the complexities of managing plastic waste due to its persistence in the environment and the need for specialized recycling processes. Overall, these findings highlight the importance of effective waste management strategies.

Rodrigues (2022) and Dixit and Joshi (2019) found significant concern about waste from liquid materials, such as paint, sealants, and other materials. The mean rating for packaging waste from deliveries was 3.93, indicating variability in responses. Personal protective equipment (PPE) waste had the lowest mean score of 3.85, suggesting a lower level of concern compared to other waste types. These findings highlight the need for improved handling and recycling methods for liquid construction materials.

The survey results from Triacta Plc Bauchi reveal that while they have implemented recycling practices for construction waste, there is room for improvement. The mean score of 3.52 suggests that a written recycling policy is essential but may not be uniformly enforced across all sites. The mean score of 3.60 for waste segregation procedures indicates that while some procedures are established, their effectiveness varies. The mean score of 3.72 for the availability of dedicated recycling bins and facilities

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suggests that they need to be adequately equipped and accessible. The mean score of 3.42 for regular training for staff on recycling practices indicates that it may not be sufficient or comprehensive, leading to gaps in staff understanding and implementation of recycling practices (Zhang & Li, 2020).

The mean score for engagement with external recycling service providers is 3.39, suggesting moderate interaction. Wang & Zhang (2021) suggest that increased collaboration with these providers could enhance recycling efforts and waste management. García-Segura & Gutiérrez (2021) suggest robust evaluation methods for assessing program success. Nielsen & Frischknecht (2020) highlight the need for robust reporting and feedback mechanisms on recycling performance, with the lowest mean score of 3.38, suggesting less emphasis on these mechanisms. A stronger focus on these mechanisms could refine recycling strategies and improve overall performance.

The mean score of construction waste recycling in Table 7 indicates several primary challenges, including resistance to change, perceived time-consuming processes, logistical complexity, lack of awareness, and the difficulty in separating and sorting mixed construction waste. These factors, as noted by Brinkmann and Hansen (2019), are often cited as major barriers to implementing sustainable practices in construction. Cowan and Johnson (2020) and McDonald and Smith (2021) also highlight the perceived time burden and logistical challenges associated with recycling. The lack of awareness about the benefits of recycling, particularly the difficulty in sorting mixed construction waste, is also a significant barrier. Insufficient infrastructure for waste collection and recycling is a significant deficiency, as reported by Lee and Wong (2019). The high costs associated with recycling technology and processes are a major financial concern. Overall, these factors contribute to the challenges in the widespread adoption of construction waste recycling.

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

This section provides an overview of the study's findings, draws conclusions based on the results, and offers recommendations for improving the impact of standard waste management practices on construction sites in Bauchi. It

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also discusses the limitations of the study and its contribution to existing knowledge, while suggesting directions for future research.

SUMMARY OF FINDINGS

The survey results reveal several key insights into construction waste management practices and challenges at Triacta Plc Bauchi. The study revealed that the significant waste types generated by the construction industry included demolition materials, excavation earth, and unused materials.

The study findings show that while some recycling practices are in place at Triacta Plc Bauchi, significant improvements are needed. The effectiveness of the written recycling policy and waste segregation procedures is inconsistent. Furthermore, the availability of recycling bins, staff training, and partnerships with external recycling providers also require enhancement.

Finally, the study revealed that the challenges hindering recycling adoption were; resistance to change, logistical complexities, inadequate infrastructure, and high costs.

CONCLUSIONS

The study concluded that while Triacta Plc Bauchi has identified significant types of construction waste, such as demolition materials, excavation earth, and unused materials, there is a pressing need for improvements in recycling practices. Although some recycling initiatives are in place, their effectiveness is inconsistent, and critical components such as the recycling policy, waste segregation procedures, recycling bins, staff training, and partnerships with external providers require enhancement. Additionally, challenges including resistance to change, logistical complexities, inadequate infrastructure, and high costs hinder the adoption of effective recycling practices. Addressing these issues is essential for optimizing waste management and promoting sustainability within the company.

RECOMMENDATIONS

Based on the above findings of the study, it is recommended the following recommendations were made;

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i. Strengthen Policy Implementation: Improve the enforcement of the recycling policy and waste segregation procedures to ensure consistent effectiveness and compliance among all staff.
ii. Enhance Training Programmes: Develop and implement comprehensive training sessions focused on recycling practices to increase staff awareness, engagement, and participation.
iii. Invest in Infrastructure: Allocate resources to improve recycling infrastructure, including the availability of recycling bins and logistical support, to facilitate smoother recycling processes on-site.

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