

# Construction Waste Management and Its Impact on Project Cost and Sustainability

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**Abstract**—Construction Waste Management is an important part of sustainable development. The construction industry supports economic growth but at the same time it generates a large amount of waste. This waste creates environmental problems and also increases the total cost of construction projects. Waste is produced at different stages of construction including planning design procurement and execution. The main reasons for this are poor planning design mistakes over ordering of materials and improper handling at the site. In many situations materials get damaged lost or remain unused which results in financial loss and lower efficiency. In recent years more attention has been given to sustainable construction and waste reduction. Methods like recycling reuse and green building practices have been introduced. However, these methods are not always easy to apply at the site level and sometimes they increase the project cost. Because of this many projects do not fully follow these practices. There is a need for a simple and practical solution that can be easily used on construction sites without increasing cost. This study focuses on identifying the causes of construction waste and its effect on cost and sustainability. It also suggests a low-cost onsite material exchange and reuse system to improve material usage and reduce waste. This approach can help improve efficiency reduce cost and support sustainable construction.

**Index Terms**—Construction waste, waste management, project cost, sustainability, green building, material reuse, on site waste management.

## I. INTRODUCTION

The construction industry is one of the major contributors to economic development, but it also generates a large amount of waste. Construction waste includes materials such as concrete, bricks, steel, wood and packaging, which are often wasted due to poor planning and inefficient practices at the site. This

waste not only affects the environment but also increases the overall cost of construction projects. With the increase in construction activities, the problem of waste generation has become more serious. Improper disposal of waste leads to environmental issues such as land pollution and depletion of natural resources. At the same time, material wastage leads to additional cost, making projects less efficient.

Although sustainable construction practices and green building concepts have been introduced, waste management is still not given enough importance. Many developers believe that waste management practices increase project cost, which limits their implementation. However, studies show that poor waste management itself leads to cost overrun and inefficiency.

Therefore, there is a need to understand construction waste and develop practical solutions that can reduce waste without increasing cost. This study focuses on analyzing construction waste and its impact on project cost and sustainability.

## II. RESEARCH GAP

From the review of existing studies, it is clear that construction waste management has been widely discussed, but there are still certain gaps. Most studies focus on recycling and disposal of waste after it is generated, rather than reducing waste at the source. There is also a strong focus on advanced technologies and systems, which may not be practical for all types of construction projects.

Another important gap is that many sustainable waste management methods are associated with additional cost, which discourages their implementation. While large scale projects may adopt such methods, small and medium scale projects often lack the resources to

implement them. There is limited focus on simple and low-cost solutions that can be easily applied at the construction site. Practical approaches that focus on reuse of materials within the site are not given enough attention. This study attempts to address this gap by proposing a simple and cost-effective method for managing construction waste.

### III. OBJECTIVES

The main objective of this study is to analyse construction waste and its impact on project cost and sustainability. The study also aims to understand the causes of waste generation and review existing waste management practices. Another objective is to identify the limitations of current methods and propose a simple and practical solution for reducing construction waste at the site level.

### IV. SUSTAINABLE CONSTRUCTION WASTE MANAGEMENT AND COST OPTIMIZATION

#### 1. Construction Waste Scenario

Construction waste is generated at different stages of a project including design, procurement and execution. Materials are often wasted due to inaccurate estimation, over ordering and poor coordination between different teams. In many cases, waste is not properly managed and is directly disposed, which increases both cost and environmental impact. Waste generation leads to inefficient use of resources and increases the need for additional materials. This directly affects the project budget and reduces overall efficiency. In addition, disposal of waste requires transportation and landfill space, which further increases cost.

Optimization through waste management involves improving material utilization and reducing unnecessary loss. By treating waste as a resource instead of a problem, it is possible to reduce cost and improve sustainability. Proper planning, monitoring and reuse of materials can help in achieving better project performance.

#### 2. Sustainable Construction Waste Management

Sustainable waste management focuses on reducing the environmental impact of construction activities while maintaining efficiency. The concept of reduce, reuse and recycle plays an important role in achieving

sustainability. Reduction involves minimizing waste generation through proper planning and design. Reuse focuses on using leftover materials in other activities, while recycling involves processing waste materials for future use.

Among these approaches, reuse is considered the most practical and cost-effective method, especially for smaller projects. Proper storage of materials, skilled labour and effective supervision also contribute to waste minimization. Although sustainable practices provide long term benefits, their implementation is often limited due to cost concerns and lack of awareness. Therefore, there is a need for simple and practical solutions that can be easily adopted in construction projects.

#### 3. Impact on Project cost

Construction waste has a direct impact on project cost as it leads to additional expenses for materials, labour and disposal. When materials are wasted, new materials need to be purchased, which increases the project budget. Poor waste management also affects productivity and may lead to delays in project completion. Even a small percentage of material wastage can result in a noticeable increase in cost. In addition to financial impact, waste also affects resource efficiency and sustainability. Therefore, managing construction waste is important for improving both cost efficiency and project performance.

### V. METHODOLOGY AND PROPOSED APPROACH

This study is mainly based on analysis of existing research papers and understanding of construction practices. Information related to construction waste, its causes and its impact on project cost and sustainability was collected from different studies. Based on this understanding, a simple and practical approach is developed to reduce construction waste at the site level. The proposed method focuses on an onsite material reuse approach, which aims to improve material utilization and reduce waste generation. In most construction projects, leftover materials are treated as waste and are disposed without considering their reuse potential. This leads to unnecessary loss of resources and increase in project cost. The proposed approach tries to change this practice by treating

leftover materials as useful resources.

In this method, a small designated area is identified within the construction site for collecting and sorting leftover materials. Materials such as broken bricks, concrete pieces, steel scraps and wood are separated based on their type and usability. Instead of discarding these materials, they are carefully inspected and reused in suitable construction activities. For example, broken bricks can be used for filling works, concrete waste can be used as sub base material and leftover wood can be used for temporary supports or formwork. Another important part of this method is regular monitoring of material usage. At the end of each working day, the site supervisor checks the quantity of unused materials and identifies items that can be reused. This helps in reducing unnecessary ordering of new materials. Proper storage practices are also followed to prevent damage due to weather conditions, which further reduces wastage. To understand the practical application of this method, a simple case-based situation can be considered. In a typical residential construction project, materials such as cement bags, bricks and steel are often wasted due to improper storage and handling. If a reuse system is implemented, damaged bricks can be used for non-structural works such as filling or landscaping. Similarly, small leftover steel pieces can be used in secondary structural elements. This reduces the need for fresh materials and helps in controlling cost.

The proposed approach is simple and does not require advanced technology or additional investment. It mainly depends on proper planning, supervision and awareness among workers. This makes it suitable for small and medium scale construction projects where implementing complex waste management systems may not be feasible. Overall, the methodology focuses on improving efficiency by reducing waste at the source and promoting reuse of materials within the site. By adopting this approach, construction projects can reduce material wastage, minimize cost and improve sustainability.

## VI. CASE STUDY

The case study of construction and demolition waste management in Hong Kong provides an example of how proper waste management practices can improve sustainability. Due to limited land availability, Hong

Kong faced serious challenges related to waste disposal.

To address this issue, strict regulations and waste management policies were introduced. Construction sites were required to separate waste materials and promote recycling. Waste charging schemes were also implemented to reduce unnecessary disposal.

As a result, there was a reduction in the amount of waste sent to landfills and an increase in recycling of materials. This case study shows that proper planning and management can improve waste control. However, such systems may require additional cost and infrastructure, which may not be feasible for all projects.

## VII. RESULT AND DISCUSSION

The analysis of construction waste shows that it has a significant impact on both project cost and overall efficiency. From the review of previous studies and understanding of construction practices, it is observed that a considerable amount of material is wasted due to poor planning, improper handling and lack of coordination at the site. This results in increased expenses for purchasing additional materials and managing waste disposal. It is also evident that construction waste contributes to time delays in projects. When materials are not properly managed, it affects the workflow and reduces productivity. This leads to inefficient use of labour and equipment, which further increases project cost.

The proposed on-site material reuse approach provides a practical solution to this problem. By collecting and sorting leftover materials within the site and reusing them for other activities, it is possible to reduce waste generation. This directly reduces the need for new materials and helps in minimizing project cost. Compared to conventional waste management practices, which mainly focus on disposal and recycling, the proposed method focuses on reuse before waste is generated. This makes it more effective and economical, especially for small and medium scale projects. The method does not require additional investment or advanced technology, which makes it easier to implement. Overall, the results indicate that simple and practical approaches can significantly improve material utilization and reduce construction waste. This not only helps in cost

optimization but also supports sustainable construction practices by reducing environmental impact.

### VIII. CONCLUSION

Construction waste management plays an important role in improving project performance and sustainability. Improper handling of materials leads to increased cost and environmental impact. Although various waste management practices are available, their implementation is often limited. This study highlights the importance of understanding construction waste and its impact on project cost. It also proposes a simple and cost-effective method for managing waste at the site level. By adopting such approaches, construction projects can reduce waste, save cost and contribute to sustainable development.

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