Construction Waste Generation Causes in Residential Project in Pune Region

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ABSTRACT

Construction material waste has been recognized as a major problem in the construction industry. This construction waste has an adverse impact on the performance and economic growth of the construction industry. Hence, the minimization of construction waste is now becoming an imperative issue. This paper mainly aims at reviewing the causes of construction material waste and its estimated amount focusing on a multi-storeyed residential building in the Pune region. To accomplish the aim of the study the questionnaire-based survey is conducted with the different project participants. Findings from the study show the causes of waste generation and the volume of material waste in residential projects. Also, the managerial framework is suggested to overcome the problem.

I. INTRODUCTION:

Construction waste consists of unwanted material produced directly or indirectly by the construction process. Construction activities can generate large amounts of waste materials that they require to be disposed of. Significant amounts of construction waste are arising from construction, renovation, explosion activities, surplus, damaged products and material arising in the course of construction work. Construction waste includes that waste also which is generated during construction activities (such as packaging, or the products of demolition) and materials that are surplus to requirements (as a result of over-ordering or inaccurate estimating). Waste in construction is important not only from the perspective of productivity of the project but also from the environmental considerations. Many times the actual percentage of waste generation is much higher than examined initially. Construction waste generated on new construction sites is in

large amount and this construction waste can affect construction cost. It means there is plenty of scope for improving project productivity simply by minimizing or reducing construction waste regarding this matter, there is a need to find out the causes of material waste generated at the Construction sites by the material. Plenty of construction waste is made up of the material which is damaged or unused for various reasons during construction. An observational study has shown that this can be vary from 2% to 40% of the materials that go into a building, a much higher than a percentage which is usually assumed by the construction industry. Since there is an opportunity for minimizing this construction material waste and increase the productivity of the project.

i. RESEARCH QUESTIONS

What are different types of construction waste is getting generated in a residential project and how?

ii. AIM

To study various types of construction waste getting generated and its causes in a residential project in the Pune region.

iii. OBJECTIVE

- To study and identify the causes of construction waste generated in the residential projects.
- Determine the type and estimated volumes of construction waste generated in residential projects.
- To find out the techniques for reduction of the construction waste.

iv. SCOPE OF THE PROJECT

To find out and differentiate construction waste generated in residential building.

v. NEED OF THE PROJECT

To eliminate all kind of construction waste and add value to the project.

vi. LIMITATIONS

This study is focusing on the causes of construction waste generated at the Construction site which not include the demolition waste.

II. METHODOLOGY

In research methodology following step are carried out

Background study and introduction-In background study few articles on construction waste generation in Pune region is reviewed and introduction is given.

Literature review –In this study 3 research paper on construction waste is studied and Different facts are found out.

Interview with project participants –In this step interview with different project participants is done. Questionnaire is circulated among 20 participants and the result found is shown in bar chart.

Data collection from survey and sample study –Necessary data for research is collected from survey study and sample study.

Data analysis- Data collected from sample study is shown in Table -01. The comparative study between 3 sample studies is presented in Table 01.Anlaysis is done to find out the particular causes for material waste.

Findings & Conclusion- Based on all this study some facts and findings are defined.

Recommendation –On the basis of this research study and from conclusion some new techniques for minimization of construction waste is recommended.

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│   Interview with project│
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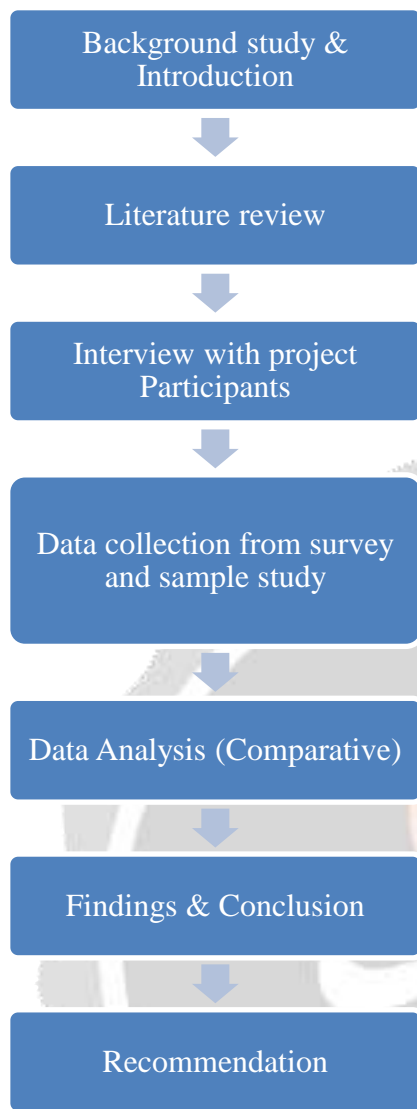
III. LITERATURE REVIEW

"The impact of construction and demolition waste on Indian Environment "by Sakshi Gupta & Malik RK had analyzed about the C & D waste generated in Indian construction industry and study shows there is no systemized effort has been made for C&D waste management and they gave concept about Re-utilization and recycling, quality standards and for the recycled or reused product are have to be formulate and supervise by Indian Bureau of standards [i]. "A Review of Construction Waste Cause Factors" (2011) by Sasitharan Nagapan, Ismail Abdul Rahman,Ade Asmi analyzed about the waste generation causes and its negative impact and study shows that Significant factor for waste generation is 'Frequent design changes'. Meanwhile wrong material storage, workers mistake, ordering error is also the causes. Suggestion is, in preliminary stage there is a chance to find out the causes and also the method which will minimize the waste [ii]. "Construction waste management in India" by Job Thomas, Wilson P. M. analyzed that Waste minimization and waste management programs are started in India. It is possible to minimize the volume of C&D waste generated by identifying the potential waste early in the design. But even with proper resource-efficient design and by adopting proper construction and deconstruction procedure, wit is possible to reduce the waste generation [iii].

IV. 1.DATA COLLECTION FROM SURVEY

To identify waste in construction practice of residential project, a questionnaire based survey was conducted. The survey was carried out with different project participants (Architect, Project Engineer, Civil Engineer, and site Engineer).

The structure of this questionnaire is it consists of 20 questions on waste generation causes. For this questionnaire survey Likart scale (odd no) is used [iv].

Waste generation causes
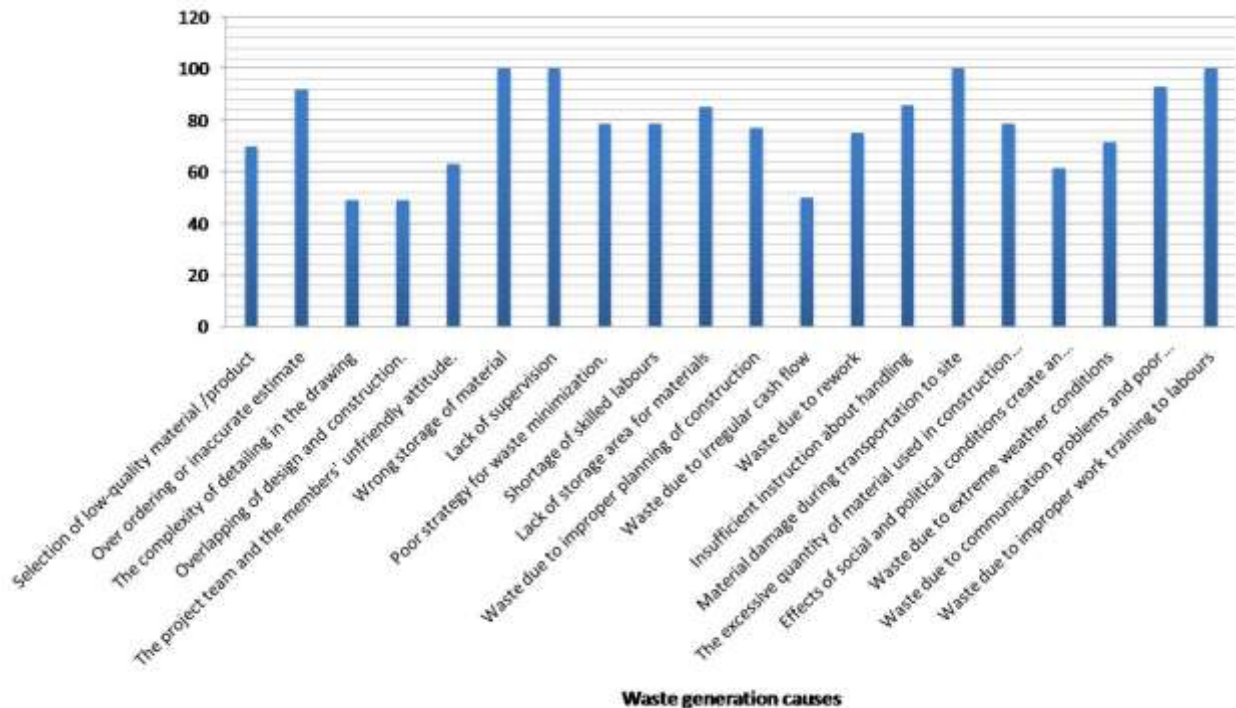
Bar Chart showing waste generation causes and its percentage

1V.2. SAMPLE STUDY:

Sample size: It is focused only on residential buildings which are 11 to 14th multistoried building located in Pune region. However, this limitation in Sample size will impact the Results of the study and it will provide optimistic values.

Sample no-1 is Janki Rainbow located in Baner, project area is one Acre consist of 3 tower and 55 units. Sample no-2 is Gurumauli Vihar located in Banner, project area is 0.58 Acres consist od 1 building of 32 units. Sample no-3 is Pebbels Urbania located in Bavdhan project area is 9.73 acres consist of 7 towers -628 units. All sample are in Pune region. Workers camp and material storage are present on all sites.

This sample study is done for finding out the major causes of waste generation and to make this study more precise. From these sample study the material waste percentage is found and the different reasons behind different material waste is also analyzed.The waste percentage in this paper is considered as a quantity measure. Data in Table 01 is showing a comparison between three sample study actual waste percentages of material waste on this sites and causes beyond the waste generation.

IV.3. DATA COLLECTION FROM SAMPLE STUDY

This data is collected by comparing three sample studies with each other to know the construction material wastage percentage .Material waste causes are also find out in this study are showed for every material.

Sr. No	Material	Material waste in percentage			Material waste causes
		Sample -01	Sample -02	Sample -03	
1	Cement	10%	12%	10%	▪ Poor supervisory system ▪ Improper handling ▪ Bad storage ▪ Frequent transportation of materials on site ▪ Lack of on-site materials management
2	Concrete	10%	15%	12%	▪ Poorly constructed formwork ▪ Poor supervisory system ▪ Improper handling ▪ Lack of management team and labor awareness ▪ lack of quality management system
3	Ready mix plaster	8%	5%	6 %	▪ Poor technology and poor construction techniques
4	Sand	12%	15%	10%	▪ Over-sized building components during construction ▪ Bad storage
5	Bricks	10%	5%	8 %	▪ Improper handling ▪ Poor supervisory system
6	Blocks	8% (Siporex)	10% (AAC)	12 % (Ecolite)	▪ Unsuitable cutting ▪ Lack of skilled workers and subcontractors ▪ Damage during to transportation
7	Steel	12%	5%	4 %	▪ Cutting and bending waste unsuitable cutting ▪ Lack of proper supervision team ▪ Poor construction techniques
8	Tiles, Granite	5%	6%	5 %	▪ Unsuitable cutting ▪ Lack of skilled workers and subcontractors ▪ Manufacturing defects ▪ Forced cutting to match required dimensions ▪ Selection of low quality materials
9	Wood	5%	5%	7 %	▪ Cutting waste ▪ Decay woods
10	Gypsum	30%	40%	40%	▪ Poor technology ▪ Improper handling

11	Paint	6%	8%	5 %	- Lack of labor awareness - Rework required because of workers' errors - Selection of low quality materials
12	Electrical wires	4%	3%	2%	Cutting waste
13	Plumbing fittings	7%	8%	7%	- Cutting waste - Poor handling unsuitable cutting
14	Packaging	40%	30%	35 %	Packaging waste of tiles, plumbing fittings, electrical fittings etc.

Table 01: Comparative analysis between 3 sample study

V. FINDINGS & CONCLUSION

Findings from the questionnaire survey and sample study are there are many causes behind waste generation and material percentage found from the sample study is around 2% to 40%.This percentage of the material impacts the project cost .This study proofs that there is a chance to eliminate and minimize the construction material waste and it will be beneficial for the project in terms of cost savings and value addition.

Through this study, a better understanding of construction waste generation in Pune region was achieved. The major causes of construction waste generation in residential projects were determined. An investigation into sample-study sites was effectively undertaken with regards to construction waste generation. From the study it is concluded that more than 90% of the respondents confirm that main causes behind the waste generations are over ordering, wrong storage of materials, lack of supervision, communication problem and improper work training. The results obtained shall be helpful to improve current waste management practices in Pune region by providing useful information. Also a database of information concerning the quantity of construction material waste generated in residential projects was developed. Construction material waste quantity found from the sample study is around 2% to 40%. This quantity of the material waste impacts the overall project cost. Hence, study proofs that there is a chances to eliminate and minimize the construction waste and it will be beneficial for the project in terms of cost savings, value addition and gives the potential for managing the waste generation by using new technology.

VI.RECOMMENDATION:

The research comes to the following recommendations-

- Providing techniques to minimize changes in design and damaged materials on site.
- Building an organizational culture in design and construction firms to adopt and apply innovative principles like Lean Construction to reduce construction waste.
- Improving the application of 5S, recyclable materials, and last planner system to reduce waste in projects as its knowledge is common between engineering organizations.
- Ensuring that the proper use of skills in construction projects as it plays a major role in providing the needed outcome from the project.

VII. REFERENCES

[i] "A Review of Construction Waste Cause Factors" (2011) by Sasitharan Nagapan, Ismail Abdul Rahman,Ade Asmi

[ii] "The impact of construction and demolition waste on Indian Environment "by Sakshi Gupta & Malik RK Department of Civil Engineering, Amity University Haryana, India,2012

[iii] "Construction waste management in India "Job Thomas, Wilson P. M. American Journal of Engineering Research (AJER) 2013

[iv] "Lean Technology And Waste Minimization In Construction Industry using SPSS"T.Subramani,Akhil Raj, Altaf, International journal of emerging trends and technology in computer science ,April 2018

[v] "Construction waste minimization" Monika Mhaske1, Milind Darade, Pranay Khare International Research Journal of Engineering and Technology (IRJET) July -2017

[vi] "Effective Utilization of Lean Management in Construction Industry" A.Chandrasekar, M.Logesh Kumar International Journal of Engineering and Innovative Technology (IJEIT) June 2014