IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

Impact Factor 8.311 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 4, April 2026

DOI: 10.17148/IARJSET.2026.13439

Investigation and Recycling of Debris at Construction Site

Prof. Dipika Mali[1], Isha Mahale[2], Payal Chaudhari[3], Mayuri Patil[4], Minakshi Thosare[5]

Department of Civil Engineering, SSBT College of Engineering and Technology, Jalgaon, MH, India[1]

Civil Engineering Student, SSBT College of Engineering and Technology, Jalgaon, MH, India[2]

Civil Engineering Student, SSBT College of Engineering and Technology, Jalgaon, MH, India[3]

Civil Engineering Student, SSBT College of Engineering and Technology, Jalgaon, MH, India[4]

Civil Engineering Student, SSBT College of Engineering and Technology, Jalgaon, MH, India[5]

Abstract: Recycling of concrete debris can make a contribution to reduce the total environmental impact of the building sector. To increase the scope for recycling in the future, aspects of recycling have to be included in the design phase. Besides, aggregate sources near Metro Manila are almost depleted, so aggregates have to be brought from far quarries. Consequently, reclaiming aggregates from concrete debris would lead to environmental and economic benefits. This experimental study aimed to use crushed concrete debris as alternative fine aggregate in a mortar mixture. A conventional mortar mixture will be compared to concrete debris mixture of the same proportions.

Keywords: Aggregate, concrete debris, construction material, mortar mixture, recycled waste

I. INTRODUCTION

The construction industry in India is one of the fastest-growing sectors of the economy, contributing nearly 10% to the national GDP. Over the past decade, it has grown at an annual rate of 10%, which is significantly higher than the global average of 5.5%. It is estimated that nearly 70% of India's future building stock is yet to be constructed. The total built-up area is expected to increase from 21 billion sq. ft. in 2005 to approximately 104 billion sq. ft. by 2030.

This include waste from demolished structure, renovations in the real estate sector and construction and repair of roads, flyovers, bridges, etc. To this is added the emorsum debris that follows disaster such as during the Uttarakhand floods in 2013 globally cities generate about 1.3 billion tonne of solid waste per year. This volume is expected to increase to 2.2 billion tonne by 2025, says a 2012 report by the World Bank. Building materials account for about half of all materials used and about half the solid waste generated worldwide. But C&D waste can be an invaluable source of building materials. In fact,the recent controversy in India over sand mining has put the the spotlight on the need to recycle, resuse and substitute naturally sourced material also says building materials TIFAC also says building repair produces 40-50 kg per sq of waste.

Assuming that one third of the existing building stock underwent some sort of repair or renovation in 2013. India must have generated an average of 193 MT of C&D waste just from repair and renovation in that year. Thus, the total waste generated in India just by buildings in one year –2013 amounts to a humungous 530 MT, 44 times higher that the official estimate. imagine the scenario if the waste generated by infrastructure projects such as roads and dams are added.

II. LITERATURE AND REVIEW

2.1 Purchase, C. K. et al. (2021) Publication: Materials – "Circular Economy of Construction and Waste" Findings: This study reviews circular economy strategies for managing construction and demolition (C&D) waste. It identifies policy gaps and market barriers that limit large-scale reuse of materials. The authors highlight that design-for deconstruction plays a critical role in enabling efficient material recovery and promoting sustainable construction practices.

2.2 Pereira, P. M. (2022) Publication: Sustainability [MDPI] – Literature Review on Recycled Aggregates Findings: The study compares the engineering properties of recycled aggregates with those of natural aggregates. It concludes that recycled aggregates are suitable for many unbound pavement applications when adequate processing and quality standards are followed. Proper treatment reduces variability and ensures performance compatibility.

International Advanced Research Journal in Science, Engineering and Technology
Impact Factor 8.311 ⁘ Peer-reviewed & Refereed journal ⁘ Vol. 13, Issue 4, April 2026
DOI: 10.17148/IARJSET.2026.13439

2.3 Patil, Y. R. (2024) Publication: International Journal – Review on Structural Application Findings: This review examines the structural applications of recycled C&D materials and finds them feasible for use in noncritical structural elements and various civil works. The main limitations identified include strength variability, presence of contaminants, and the need for stricter quality control methods.

2.4 Papamichael, I. et al. (2023)
Publication: PMC – Environmental Sciences Review Findings: A PRISMAbased mini review that maps key obstacles to implementing circular practices in the C&D sector. It recommends policy incentives, improved tracking systems, better sorting technologies, and clear endof-waste criteria to enhance recycling efficiency and encourage wider adoption.

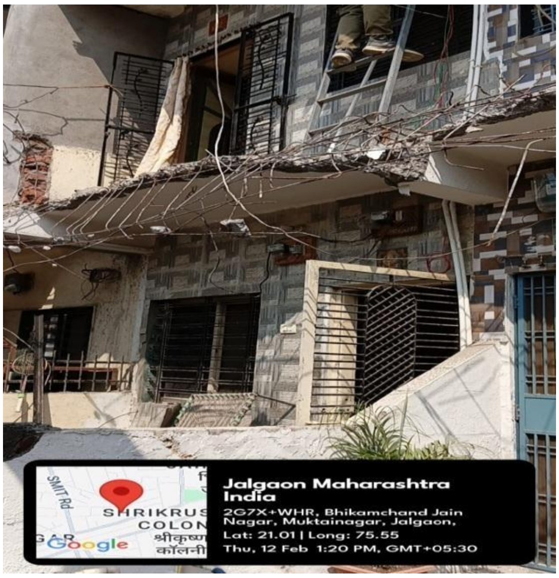
2.5 Ram, V. G. et al. (2020) Publication:
Journal of Cleaner Production – Environmental LCA Study Findings: Lifecycle assessment results show that recycling C&D waste significantly reduces environmental impacts compared to landfilling. Recycling leads to substantial reductions in greenhouse gas (GHG) emissions and conserves natural resources, especially when recycled materials replace virgin aggregates in construction.

III. METHODOLOGY

3.1. Data Collection
Conduct site visits to observe the types and quantities of debris generated. Gather information through surveys, interviews with contractors, engineers, and workers. Collect project documents such as BOQs, material usage records, and waste logs. Record debris generation patterns during demolition, excavation, and construction phases.

3.2. Classification of Debris
Categorize collected debris into major groups such as: Concrete and masonry waste Steel and metal scrap Wood waste Plastics, packaging materials Soil and excavated materials Glass, tiles, ceramics Identify hazardous vs. non-hazardous wastes. Assess recyclability and contamination level of each category.

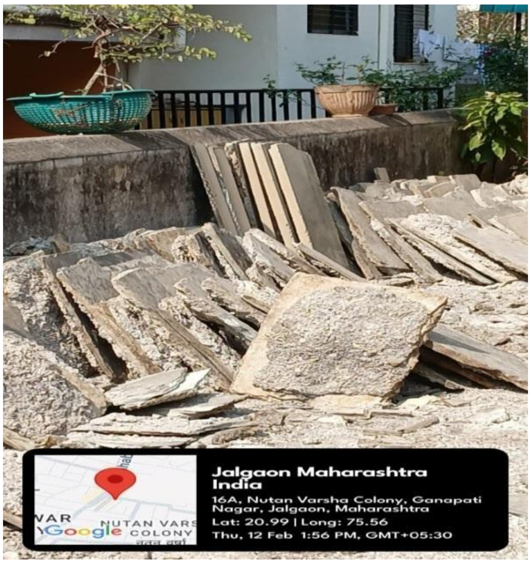
DOI: 10.17148/IARJSET.2026.13439



3.3. Onsite Handling and Segregation

Analyze current onsite waste management practices. Document procedures for collection, temporary storage, and separation of materials. Evaluate available infrastructure: bins, skips, sorting areas.

Recommend improved segregation practices (color-coded bins, separate zones, trained labor).



3.4. Recycling and Reuse Methods

Identify recycling options for each category: Concrete → crushed for aggregates or road sub-base Steel → sent to metal recycling units Wood → reused for scaffolding, formwork, or converted into chips Bricks/blocks → reused for secondary construction or paving Plastics → processed in recycling plantsStudy existing recycling facilities and their feasibility. Explore on-site reuse opportunities to minimize transportation and disposal costs.

3.5. Transportation and Storage

Evaluate the logistics of moving debris from site to recycling or disposal centers. Document vehicle types, frequency of transport, and storage capacity. Assess compliance with municipal guidelines for transporting C&D waste.Recommend efficient methods for safe storage, handling, and transfer.

3.6. Reporting and Recommendations Prepare detailed analysis of debris quantity, type, handling, and recycling potential. Identify gaps between current practices and best waste management standards. Provide cost–benefit analysis of adopting recycling techniques. Suggest actionable recommendations for improved

DOI: 10.17148/IARJSET.2026.13439

C&D waste management: On-site segregation plans Tie-ups with recycling plants Training programs for workers Waste reduction strategies in design and planning stages Conclude with sustainability impacts and long-term waste management plan

IV. CONCLUSION

In conclusion, recycling construction debris is both an environmental responsibility and an economic opportunity. By integrating sustainable waste management practices into construction projects, the industry can contribute significantly to environmental protection, resource conservation, and long-term sustainable development. This project on the investigation and recycling of construction debris highlights the critical importance of sustainable waste management in the construction industry. The study revealed that a significant portion of construction and demolition waste—such as concrete, wood, metals, bricks, and plastics—can be effectively reused or recycled instead of being sent to landfills.

Through proper waste segregation, on-site management, and the adoption of modern recycling technologies, construction debris can be transformed into valuable resources. Recycled concrete can be reused as aggregate, metals can be reprocessed without loss of quality, and wood and other materials can serve secondary purposes. These practices not only reduce environmental pollution but also conserve natural resources and decrease overall
project costs

REFERENCES

[1]. C.S.Poon, A.T.W.Yu, I.Jailon, and E.Cheung(2004)."constr.Manage.Econom., " vol.22, pp.799-805.
[2]. M.S.W.M.Ai-Ghamdi (2016). "A study on Construction and demolition waste management: China's lessons," Waste manage.Res., vol.34, pp.397-398.
[3]. M.Morales-Conde, E.Ayuga-Tellez, M.Perez-Gracia, M.L.Reyna, G.G.RosalesPrieto, and F.A.Perez-Garcia (2020). "Physical and mechanical properties of wood gypsum composites from demolition material in rehabilitation works," Waste Manage.Res., vol38, no, pp.520-530.
[4]. S.Huda and T.S.K.A.Huda (2018). "Mechanical behaviour of three generations of 100% repeated recycled coarse aggregate concrete," J.Build.Eng., vol, pp.497-506.