Baltic Journal of Real Estate Economics and Construction Management
ISSN: 2255-9671 (online)
2026, *14*, 56–70
https://doi.org/10.2478/bjreecm-2026-0004
https://content.sciendo.com

IDENTIFYING KEY DRIVERS OF COST REDUCTION IN CONSTRUCTION WASTE MANAGEMENT: EVIDENCE FROM INDIA

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Received 05.01.2026; accepted 08.02.2026

Abstract. As the fourth largest construction industry in the world, the construction industry in India contributes 8 % to the national GDP, and it faces a serious problem of dealing with the 12–15 million tonnes of construction and demolition (C&D) waste produced every year. By 2050, it is estimated that the landfill space needed will be 88 square kilometres, making waste management strategies that are cost-effective for the environment urgent in the quest for sustainable development. This article examines issues that affect cost reduction in construction waste management in India by conducting an extensive survey of 210 industry stakeholders. The study uses descriptive statistics and factor analysis processes in SPSS 29 to determine and rank important variables that influence waste management. Findings indicate that on-site waste segregation has the highest factor load (0.881), followed by stakeholder awareness and participation with the traditional and modern construction practices, recording correlation values of 0.871. The paper uses the theory of planned behaviour (TPB), lean construction principles, and a circular economy model to develop viable cost-cutting measures. The results show that systematic waste segregation, stakeholder education, recycling programme effectiveness, and sustainable materials selection have a significant impact on the total cost of the project. The study provides empirical data to prove the hypothesis that the choice of materials and design, construction methods, the attitude of stakeholders, and waste management strategies have a positive impact on cost-cutting efforts. The policy recommendations emphasise the government-industry partnership, creation of infrastructure to support waste processing plants, and the strengthening of the regulatory frameworks to achieve economically viable and environmentally sustainable construction practices in India.

Keywords: *Construction waste management, cost reduction, factor analysis, India, sustainable construction, lean construction, circular economy, waste segregation.*

INTRODUCTION

Construction is a major source of economic growth, which involves the design, construction, maintenance, and renovation of built infrastructure that supports modern society. The construction industry of India is fourth in the world after the United States, China, and Japan, and has a market worth of USD1.4 trillion and is expected to grow by 7–8 % per year until 2025 (Johare et al., 2022; Samanta & Parida, 2022; Samy et al., 2023). The industry contributes about 8–18 % of the gross domestic product in India and employs 52 million people, which highlights its centrality in the economic activity of the country (Kanwar et al., 2023; Moses et al., 2019; Pandey et al., 2024; Sundaram, 2017; Sanchaniya et al., 2023). However, this fast growth creates enormous environmental problems, and waste management is one of the areas where ineffective management of construction and demolition (C&D) waste threatens economic performance and environmental sustainability.

Official government estimates suggest that 12–15 million tonnes of construction and demolition waste (C&D) is produced each year in India, but independent research shows that the real number might be 750 million tonnes when the activities of the informal sector are factored in (Barbir & Dabić, 2024; Bokarde, 2021; Marichova, 2020). Such a large stream of waste poses significant management problems, with only 12.45 % of the collected material being subjected to scientifically rigorous treatment, and the rest of the material being disposed of in the open or unlicensed dumping locations (Choudhary et al., 2022, 2023; Mihai, 2019; Rafiq & Khandaker, 2024). It is estimated that in 2050, India will require about 88 km^2 of landfill area, which is about the same size as New Delhi, to handle poorly managed municipal solid waste, such as construction waste. These projections are indicative of the need to come up with cost-effective waste management systems that can balance economic sustainability and environmental stewardship.

Inefficient waste management has economic implications that far outweigh the direct costs of disposal. Project overheads are swollen by material waste that promotes ineffective allocation of resources, redundant procurement procedures, and increased disposal costs. Landfill space is limited, increasing disposal costs, and the high regulatory compliance costs also bring additional administrative costs (Mirshekarlou et al., 2021; Svingstedt et al., 2020). Moreover, the loss of economic value of the recycling or reuse of materials and the continuation of the use of virgin resources create dependence on their extraction. These are interconnected issues that have become powerful motivators for construction businesses to adopt systematic cost-cutting approaches in their waste management activities (Farshadfar et al., 2025; Hashim et al., 2024; Hidalgo & Verdugo, 2025; Shajidha & Mortula, 2025). Research has demonstrated that effective waste management delivers measurable economic benefits through reduced disposal costs, material recovery opportunities, and reuse of construction waste in various applications (Aiguobarueghian et al., 2024; Kayenat, 2024; Liu et al., 2025).

Although there is a greater awareness of the above challenges, there is limited empirical research quantifying the determinants of the reduction in the cost of waste management in Indian construction. While recent studies have examined construction waste management practices and regulations (HaitherAli et al., 2025; Jaiswal et al., 2024; Kayenat, 2024; Mariappan & Ramasamy, 2021), waste characterisation strategies (Kapadia, 2019), and industry segmentation (HaitherAli et al., 2025), a comprehensive analysis of cost reduction drivers in the Indian context remains underexplored. Although international studies have examined waste reduction measures, the unique situation in India, where regional construction methods are heterogeneous, regulatory enforcement is inconsistent, infrastructural shortages exist, and the informal construction industry is widespread, requires specific country-specific research. Explaining the most important factors that affect cost reduction will allow construction companies, policy makers, and industry associations to develop specific interventions.

This research fills these gaps by providing systematic empirical research on factors that influence cost reduction in construction waste management. The study uses the factor analysis research design to determine and classify variables that affect cost-effective practices in waste handling. The survey conducted on 210 stakeholders in the construction industry, such as contractors, project managers, engineers, architects, and academics, provides a wide range of views on the problem of waste management and ways to solve it. The research studies hypotheses on how the choice of materials, construction methods, the attitude of stakeholders, and waste management methods influence the results of cost reduction.

The contributions of the study are as follows: (1) the empirical measurement of the main determinants affecting cost reduction in the context of construction waste management based on the Indian context; (2) a quantitative evaluation of the loadings and intercorrelations of the factors, which have been performed with the help of rigorous statistical approaches; (3) a theoretical synthesis that unites lean construction, circular economy and theory of planned behaviour models; (4) evidence-based recommendations to be offered to construction companies and policymakers based on the prioritisation of interventions. The findings provide stakeholders with viable recommendations to reduce costs and, at the same time, improve environmental performance.

1. MATERIALS AND METHODS

1.1. Theoretical Framework

This research covers three theoretically complementary frameworks to explain cost-reduction measures in construction waste management. The theory of planned behaviour (TPB) provides a conceptual lens by which stakeholder attitudes, normative expectations and perceived behavioural control are analysed in relation to the waste management decision. In construction contexts, TPB explains how individual workers, project managers, and organisations either embrace or oppose waste-minimisation practices even in the face of apparent economic or environmental rewards. Based on this, the corresponding attitudes towards waste minimisation, the perception of peer expectations and beliefs about the ability to implement changes together inform not only behavioural intentions but also waste management practices.

Lean construction concepts are based on waste removal in each stage of the project by continuous improvement, value stream optimisation, and partnering with stakeholders. Based on the ideas of the Toyota production system, lean construction recognises seven types of waste, namely, overproduction, waiting time, transportation, inappropriate processing, unnecessary inventory, unnecessary motion, and defects. When used to manage construction waste, the lean principles guide a progressive decrease in material waste through just-in-time delivery, accurate quantity estimation, modular construction methods, and continuous improvement of processes. The strategy focuses on value addition and reduces resource use and waste disposal.

The circular economy system is a challenge to traditional linear models of take-make-dispose by promoting closed-loop resource models, where resources are useful in more than one cycle of use. In the construction industry, the concepts of the circular economy are realised in the form of design to disassemble, reuse of materials, recycling them into other products, and recovering embedded energy. Unlike conventional waste management methods that focus on end-of-life disposal, circular strategies integrate waste prevention methods in the design and construction phases. Therefore, this system can harmonise economic motives and the environmental goals by redefining waste as a resource stream rather than a cost burden.

1.2. Research Design and Data Collection

The research design used in the study is a quantitative research design that uses a structured survey method to collect primary data from stakeholders in the construction industry. The survey instrument was constructed based on a systematic review of the literature that highlighted the determinants that are critical for the costs involved in the management of construction waste. The variables were grouped into three main categories: (1) material selection and design factors, which include sustainable material selection and design optimisation; (2) construction techniques and attitudes of stakeholders, including traditional and contemporary construction techniques, awareness of the stakeholders, and degree of engagement; (3) waste handling and disposal practices, including on-site segregation, recycling programmes, transport logistics and compliance with regulations.

The methodology adopted was snowball sampling to identify and recruit participants who have specialised knowledge about construction waste management. This is a nonprobability sampling technique that is especially beneficial in research on specialist professional groups where random sampling is not feasible. Initial contacts identified through professional networks were asked to suggest other participants who would fit predefined eligibility requirements, i.e., current work in construction projects, direct experience in waste management decision-making, and a desire to provide informed views on cost-reduction strategies. As a result, a diverse group of stakeholders, such as contractors, project managers, engineers, architects, and academic researchers, representing various parts of India, was recruited using the methodology.

The calculation of the sample size was aimed at 163 respondents, as required by the standard factor analysis of at least five to ten observations per variable. The total number of responses was 211, with 210 valid completed surveys remaining of the total sample after the elimination of one respondent who refused to participate. The sample size is greater than the minimum level and therefore has adequate statistical power to conduct an effective factor analysis. To cover as many geographical areas as possible and various types of organisations, the survey was distributed in a variety of ways, namely, through email, LinkedIn, and WhatsApp groups. The resulting response rate and sample composition imply that there is a sufficient representation of views in the construction industry.

1.3. Analytical Methods

Data analysis was conducted using two complementary techniques, descriptive statistics and exploratory factor analysis, which was done in SPSS 29. The descriptive part provided detailed summary statistics such as means, standard deviations, skewness, and kurtosis of each variable, thus enabling an assessment of the distributional characteristics and the determination of the appearing trends. The analysis of response patterns and the stakeholder point of view was interpreted with the help of visual analytics in the form of frequency distributions, bar charts, and demographic breakdowns.

The main inferential method used was factor analysis, which was used to identify latent dimensions and reduce the overall complexity of variables. This methodological approach brings together interrelated variables into factors that reflect underlying constructs and therefore explain patterns of variability. The extraction technique used was principal component analysis (PCA), which converted correlated variables into orthogonal components with maximum variance accounted for. The Varimax rotation was applied later to improve the interpretability of factors by simplifying the factor structure to a simple and parsimonious representation, such that a single factor had a high loading on a variable.

The adequacy of the data for factor analysis was tested using the Kaiser–Meyer–Olkin (KMO) measurement of sampling adequacy and the Bartlett test of sphericity. KMO values above 0.80 are considered to represent excellent suitability, 0.70 to 0.80 are good adequacy, 0.60 to 0.70 are acceptable adequacy, and below 0.50 are considered inadequate. The Bartlett test is used to test the null hypothesis that the correlation matrix is equal to an identity matrix; a statistically significant value ($p < 0.05$) rejects the null hypothesis and proves that there are enough intercorrelations to warrant factor analytic procedures. All these diagnostic tests certify the methodological rigour and validity of the resultant factor analytic results of the resulting factor.

1.4. Formulas and Equations

Based on theoretical frameworks and literature review, the study tests one main hypothesis and three sub-hypotheses.

Main hypothesis (HA): Factors including material selection and design, construction techniques and stakeholder attitudes, and waste handling and disposal practices have positive impacts on cost reduction for construction waste management.

H1: Among waste handling and disposal practices, on-site waste segregation has a positive impact on the cost of construction waste management in India.

H2: With respect to material selection and design, sustainable design choices have a positive impact on costs related to waste management.

H3: Among construction techniques and stakeholder attitudes, modern construction practices show a positive impact on cost reduction in construction waste in India.

These hypotheses guide the factor analysis structure and provide testable predictions on the specific mechanisms through which cost reduction occurs.

2. RESULTS

2.1. Sample Characteristics

The last sample included 210 successful responses, which was a high willingness to participate, as demonstrated by a 99 % acceptance rate. The gender distribution showed 60 % male and 40 % female respondents (Figure 1), which means that there is an incremental change in gender diversity in the construction industry in India, but one is still aware of the dominant role played by men. The age distribution was also based on career levels of early career professionals to senior executives, hence a range of experience levels. The education level included engineering, architectural, management, and specialised construction qualifications. Professional roles were also represented well, with 28 % project managers, 24 % contractors, 22 % engineers, 15 % architects and 11 % academic researchers.

The respondents covered a wide range of institutional types, including large construction companies, medium-sized organisations, small contractors, government agencies, and academic research institutions. The geographic distribution of the participants covered major metropolitan areas of the country, such as Mumbai, Delhi, Bangalore, and Chennai, and peripheral regional centres across more than 10 Indian states, capturing heterogeneity in the indigenous construction practices and regulatory milieus. The project portfolios of the participants were not limited to residential buildings but also to commercial complexes, infrastructural projects, and industrial buildings, which allowed covering the situation in the management of construction waste in a comprehensive way.

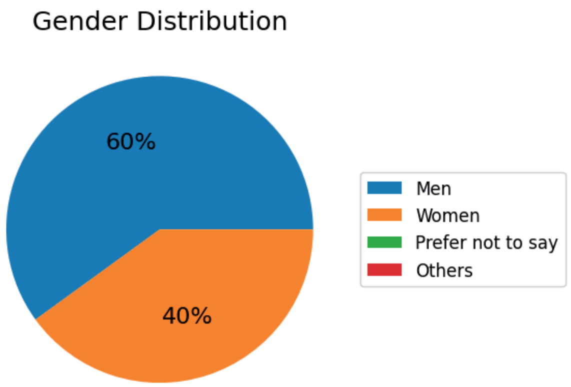

Fig. 1. Survey respondent demographics.

2.2. Descriptive Statistics

Table 1 provides a summary of the descriptive statistics of the key variables. Average scores demonstrate moderate to high agreement on the importance of different cost-cutting variables. The results of waste management in terms of cost reduction had a mean score of 1.73 (SD = 1.09), which means that there was a general recognition of the cost implications of waste management. The results of sustainable design choices provided a mean of 2.01 (SD = 1.04), and the choice of materials to be used in waste management gave a mean of 2.17 (SD = 1.07). These mean values are relatively low, and "1" represents the greatest importance, indicating that there is a great deal of agreement among stakeholders as to the relevance of these factors to cost reduction.

Table 1. Summary of Descriptive Statistics for Selected Variables

Variable	Mean	SD	N
Waste management outcomes on cost-cutting	1.73	1.09	210
Sustainable design choices	2.01	1.04	210
Choice of materials on waste management	2.17	1.07	210

Skew and kurtosis values were generally found to be acceptable to perform parametric analysis, but some variables had positive skew, suggesting ceiling effects where respondents were more likely to provide high importance ratings. Standard deviations indicated that there was a wide range of variation in the responses, indicating that there was heterogeneity in the views of the stakeholders, and at the same time showed that there was general agreement on the significance of the factors.

2.3. Results of factor analysis

The applicability of factor analysis was verified using the Kaiser–Meyer–Olkin (KMO) and Bartlett test (Table 2). The KMO measure was 0.826, which means that it has a high sampling adequacy that is well above the 0.8 mark of high-quality factor analysis. Bartlett's sphericity test showed that the results were highly significant (χ^2 = 1104.872, SD = 36, p = 0.001), indicating that the variables were sufficiently correlated to extract the factors. Such diagnostic statistics confirm the suitability of the principal component analysis.

Table 2. KMO and Bartlett's test results (*** $p < 0.001$)

Test	Value
Kaiser–Meyer–Olkin measure of sampling adequacy	0.826
Bartlett's test of sphericity (χ^2)	1104.872***
Degrees of freedom	36

The principal component analysis with varimax rotation gave three main factors that explain the cumulative variance of cost reduction variables. Table 3 presents the factor loadings of the key variables in the three extracted factors, and those with a loading greater than 0.40 are considered substantive. Factor 1, Waste Disposal Practices, includes variables that relate to on-site waste segregation, the effectiveness of recycling programs, and the logistics of disposal. Among them, on-site waste segregation was the most significant single predictor with a factor loading of 0.881, supporting Hypothesis 1 about its positive effect on cost reduction.

Factor 2, Material Selection and Design, includes variables that are related to sustainable material selection, design optimisation, and minimisation of material waste. Sustainable design options provided significant loadings that justify the claim of Hypothesis 2 that cost effects are positive. Factor 3, Construction Techniques and Stakeholder Engagement, is a group of variables capturing the current construction practice, stakeholder awareness, and collaborative methods. The traditional and modern construction practices showed a correlation of 0.871, which partially supported Hypothesis 3 and showed that cost reduction would be possible through traditional efficiency improvements or through the adoption of modern technologies.

Table 3. Key Factor Loadings and Correlation Values

Variable	Factor loading/correlation
On-site waste segregation	0.881
Stakeholder awareness and engagement	0.871
Traditional construction practices	0.871
Modern construction practices	0.871

As shown in Figure 2, the factor structure aligns with theoretical assumptions based on lean construction, circular economy, and the theory of planned behaviour. The fact that the waste segregation factor is highly loaded supports the principles of lean construction, which focus on the systematic removal of waste at the origin. The factor of material selection and design relates to the circular economy attention to resource optimisation and waste-reducing design. The stakeholder engagement variable confirms the postulations of the theory of planned behaviour, in which the attitudes, subjective norms, and perceived behavioural control collectively determine the waste-management behaviours and outcomes.

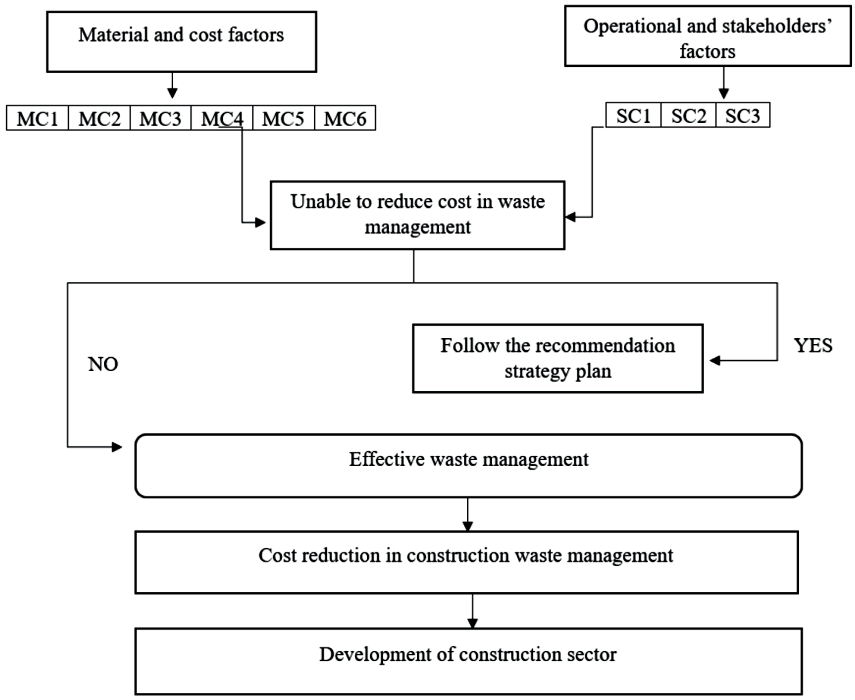

Fig. 2. Construction waste management cost reduction framework.

3. DISCUSSION

The empirical results support the hypothesised relations between the waste-management practices and the cost reduction effects. The factor load of on-site waste segregation is exceptionally high (0.881), and this is a strong indication of its central role in the achievement of cost-effective waste management. This fact is in tandem with the global literature that has shown that early-stage segregation enables material recovery, increases recycling rates, and reduces disposal expenses. In the Indian situation, where informal waste collection systems run parallel to formal ones, systematic segregation will allow valuable material streams to be harnessed and monetised instead of being disposed of.

The process through which segregation results in cost reduction works at many levels. To begin with, the segregated materials will sell at a higher price in the market to recyclers compared to the mixed waste that needs further sorting. Second, segregation reduces transportation expenses by reducing the amount of waste that has to be disposed of. Third, regulatory penalties are avoided by adhering to the Construction and Demolition Waste Management Rules (2016), which require the segregation of projects that produce more than 20 tonnes of waste per day. Fourth, separated materials allow for on-site reuse, avoiding the purchase costs of similar virgin materials.

The large factor loadings of stakeholder awareness and participation (0.871) highlight the critical role of human factors in the effectiveness of waste management practices. Technical solutions cannot be used alone without behavioural change among workers, supervisors, contractors, and project managers. The theory of planned behaviour explains this trend by assuming that the behaviour of individuals in waste management is dependent on the attitude towards waste reduction, perceived social expectations in handling waste, and beliefs about the ability to perform correct practices. Therefore, efficient cost-cutting depends on the concerted effort at organisational levels and requires the development of awareness and harmonisation of incentives.

The similar correlation coefficients (0.871) between traditional and modern construction practices indicate a salient nuance: there are various ways to reduce costs. Waste is reduced by modern practices of prefabrication, building information modelling (BIM), and precision material estimation, which are technologically advanced and more accurate in planning. Traditional practices, with their focus on skilled craftsmanship, material conservation, and the knowledge gained through experience, achieve similar results through different mechanisms. Therefore, the introduction of proper technology must be based on the evaluation of organisational capabilities and the nature of the project, and not the wholesale modernisation of any sort. The development of adequate waste processing infrastructure remains a critical challenge, requiring coordinated investment and strategic planning across India's diverse regional contexts (Gautam, 2025; Jain & Babu, 2025; Meena et al., 2024; Thenmozhi & Divakar, 2020). Market analyses indicate that sustainable construction practices, including effective waste management, are becoming increasingly important competitive differentiators in India's growing construction sector.

In policy terms, the results indicate that policies that focus on strengthening waste segregation systems and developing stakeholder capacity have the highest payback on investment in cost reduction policies. Therefore, the government could focus its efforts on the development of segregation facilities, to providing training programmes to construction staff, and carrying out demonstration projects that would show how effective the implementation has been. Additionally, the enforcement of regulations focusing on compliance with segregation would tend to have a stronger impact compared to general waste management directives, which are very challenging to monitor and enforce.

The practical implications of these findings are immense for construction business ventures that seek to gain a competitive advantage through the reduction of waste costs. Companies should invest in on-site segregation systems that include special storage facilities, clear labelling, and a system of monitoring waste streams. The economic benefits of careful segregation should be emphasised in the training programs in addition to environmental reasons. Lastly, performance measurement schemes are supposed to check waste generation, the effectiveness of segregation, and material recovery, thus making it easy to achieve continuous improvement.

The acquisition of materials deserves to be reconsidered with reference to the impact of sustainable design choices on the spending on waste. Clear indication of recycled material, adoption of a standardised dimensional design that limits cutting waste, and the choice of durable materials that minimise the number of replacements are all elements that help reduce expenses. Additionally, establishing partnerships with suppliers will allow the development of take-back programmes on packaging materials and excess supply and turn waste burdens into reverse logistics opportunities.

The current study has several limitations that limit the generalisability of the findings of the study and point to directions for future research. The cross-sectional survey design used allows capturing perceptions and interrelationships at one point in time, hence eliminating the possibility of making any causal inference. The application of longitudinal designs that track cost measures both before and after waste management interventions would produce stronger evidence of effectiveness. Although the sample set is diverse, it is mainly composed of respondents from the larger urban centres and the formal construction industry. There is still an inadequate representation of small contractors and rural construction practice, which may decrease the relevance of the findings to the diverse construction environment of India.

The analysis is subject to bias because it is based on self-reported perceptions rather than objective cost data. Respondents might overrate the effectiveness of practices they personally advocate, or vice versa, underrate the costs of interventions that they find to be cumbersome. Future studies should therefore include real project costs, accurate waste production, and a measurable rate of recycling to support perception-based results. The application of a case study approach devoted to the successful cost-reduction implementations may allow defining certain practices, organisational aspects, and situational circumstances that facilitate their effectiveness.

This research focuses on cost reduction without performing a systematic analysis of the trade-offs with other project goals, such as schedules, quality, and safety. Some waste-saving measures can be associated with time costs, such as extra sorting work, or quality risks, such as the incorrect use of recycled materials. Exploring the most effective trade-off between these competing goals would thus be useful in guiding practical implementation plans that are aware of the practical constraints facing construction managers.

The disparity in waste management infrastructure, regulations enforcement, and the market price of recyclable materials on a regional basis is also likely to create differences in the potential for cost reduction across Indian states and cities. A comparative study that evaluates the loading of factors and the cost implications in various settings may help shed light on where universal strategies can be used and where context-specific adjustments still have to be made. Knowledge of these variations would help to develop more specific policy interventions and organisational strategies.

CONCLUSIONS

This research provides empirical data to define and rank the determinants that motivate cost reduction in construction waste management in the rapidly growing built environment industry in India. Through a systematic factor analysis of survey data on 210 stakeholders in the construction industry, the study has established that on-site waste segregation, awareness and participation of stakeholders, and modernisation of construction practices are high-impact areas of intervention to achieve cost-effective waste management.

The single most influential factor is the on-site waste segregation with a load of 0.881. This validates the fact that systematic separation of materials at the time of generation creates several cost-cutting avenues, such as improved material recovery values, decreased volumes of disposal, compliance with regulations, and on-site reuse options. The result confirms Hypothesis 1 and is compatible with the tenets of lean construction, which focuses on the removal of waste at the source and not at the end of the pipe.

Sensitivity and engagement of stakeholders have a significant impact (correlation 0.871), which highlights the fact that technical interventions require that behavioural changes are applied simultaneously in order to be effective. The theory of planned behaviour framework explains this trend because it reveals that attitudinal, social, and perceived behavioural control interact to shape waste management behaviours. Based on this, organisations must invest in training, incentive plans, and cultural transformation in addition to physical infrastructure to actualise their cost-cutting potential.

The similarity in the correlation values (0.871) between traditional and modern construction practices shows flexibility in attaining cost reduction. This implies that technological progress and improved traditional practices present viable opportunities. This outcome implies that imposing modernisation requirements that are universal in nature might not be as useful as allowing organisations to choose strategies that fit their abilities and project nature.

The choice of sustainable materials and related design decisions has a significant impact on waste management costs, which is confirmed by Hypothesis 2. The mechanisms behind them are the decrease in cutting waste using standard dimensions, the decrease in the frequency of replacement due to increased durability, and the ease of recycling due to accurate material specifications. The choices taken during the initial design stage create long-term impacts on the waste generation pattern and the associated costs throughout the project life cycle.

In policy terms, the interventions' results show that the priorities should be made in three key areas: (1) the building of in-site infrastructure on segregation facilities and recycling processing capacity; (2) building of stakeholder capacity through worker training, managerial education, and demonstration projects; and (3) strengthening of regulatory frameworks with a primary focus on segregation compliance and material recovery goals. Good cooperation between government and industry is invaluable, as the experience of the private sector is combined with the convening ability of the public sector and regulatory privileges.

Practically, some of the recommendations to construction companies consist of the establishment of systematic segregation procedures that include the allocation of separate storage facilities and clear labelling, the introduction of performance measures to monitor the rate of waste production and recovery, the resources toward workforce training that emphasises the economic benefits of proper waste management, the establishment of joint arrangements with suppliers on material take-back programmes, and the specification of sustainable materials that will facilitate the minimisation of waste.

The current study contributes to the existing body of research on construction management by providing India-specific empirical evidence of the determinants of cost reduction and, therefore, confirming theoretical models, such as lean construction, circular economy, and the theory of planned behaviour, in the developing-country setting. Moreover, it shows how useful factor-analysis methodology can be in prioritising between a range of possible interventions. These results are consistent with the global literature, but incorporate the factor of the unique regulatory environment of India, the constraints of infrastructure, and the common construction behaviours.

Future research must follow several leads: (1) longitudinal studies on the effects of costs in the pre- and post-intervention periods to determine the causality of effects; (2) case studies that record successful implementation strategies including organisational factors and contextual conditions that facilitate effectiveness; (3) regional comparative analysis that examines the differences in the effects of factors in various Indian settings; (4) exploring trade-offs between cost reduction and other project goals, such as schedule, quality, and safety; (5) analysis of the informal construction sector where a large part of the waste management is not under reg.

With the rapid development and urbanisation of India in the current state, the management of construction waste will be the key determinant of economic competitiveness and environmental sustainability. The current study presents evidence-based recommendations to stakeholders who are facing this critical challenge to determine high-impact interventions that should be prioritised and invested in. Incorporating both cost-cutting and green building will allow the construction industry to play a role in the sustainable development path of India, as well as improve the profitability and competitiveness of firms.

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