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# A Systematic Review on the Social Impact of Construction and Demolition Waste Management in Construction Industry

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**Abstract**

This systematic review systematically evaluates studies assessing the social impacts of construction and demolition waste management within the construction industry from 2009 to 2024, with the aim of categorising and summarising its benefits and drawbacks for society. This review explores strategies to enhance positive outcomes and mitigate negative impacts of construction and demolition waste management, thereby enhancing the role of construction and demolition waste management in social development. It emphasizes the role of C&D waste management in fostering sustainable development by reducing carbon emissions, promoting economic growth, and enhancing social equity. Key strategies include tax reforms, emerging technologies, and public engagement. However, barriers such as weak regulations and funding gaps persist. The findings advocate for a circular economy transition through collaborative societal efforts to achieve sustainability and equity. This research provides valuable research directions for the future development of construction and demolition waste management, and researchers could delve into technological innovation, management systems, data collection, and policy reforms.

**Keywords:** Construction and Demolition Waste Management, Social Impact, Construction Industry, Sustainable Development, Social Development

## Background

Construction and demolition (C&D) wastes account for between 30 and 40 percent of all garbage generated worldwide as a result of the many development projects being done to enhance and extend urban infrastructure systems. Projections suggest that global waste generation will double by 2025 relative to 2000 levels and again by 2050 compared to 2016 (Petrović & Thomas, 2024). Numerous researchers have been working to develop efficient

ways to handle these massive volumes of C&D wastes in order to minimize the negative effects on the environment and maximize the positive effects on the economy and society (Islam et al., 2024). C&D waste through sound management tools, recycling of materials from waste, proper land use/land cover, and maintaining sustainability and green biomes for the next generation (Mahakud et al., 2021). Recycling C&D waste influences diverse facets of society, including ecological systems, natural resources, human health, economic growth, and social sustainability.

*Research Aim*

This study systematically analyzes the social impacts of C&D waste management, aiming to categorize and summarize both the benefits and drawbacks of the whole society. The analysis explores strategies to amplify positive outcomes while mitigating negative effects, with the goal of enhancing the role of C&D waste management in societal development.

*Importance of this Study*

This research is pivotal for advancing sustainable social development, providing a comprehensive summary of the ecological and socio-economic impacts of C&D waste management. It examines strategies to improve environmental quality, foster economic growth, and drive social progress through effective C&D waste management. By optimizing benefits and mitigating negative effects, the findings contribute to global sustainability initiatives and promote innovation in waste management technologies, supporting the construction industry's transition to a circular economy.

*Research Scope*

This research investigates the social impacts of managing C&D waste management in the construction industry, emphasizing key factors influencing social sustainability, including government involvement, employee training, and stakeholder engagement. Focusing on companies involved in C&D waste management, it explores the relationship between management strategies and their social outcomes. A review of existing literature assesses the current state of C&D waste management practices, with a regional focus on areas where such practices have advanced rapidly, to capture localized effects. By analyzing the societal impacts of C&D waste management, the research aims to contribute to the advancement of social sustainability.

## Methodology

The literature review for this research was retrieved through a systematic database search, utilizing Scopus, PubMed, Web of Science, and Google Scholar (Aromataris & Riitano, 2014). Boolean operators were employed to structure and refine the search strategy, enabling effective categorization of search terms (Dinet, Favart & Passerault, 2004), Table 1 showed the search strategy used by Boolean operators. It used five keywords, "construction and demolition waste management" "social impact" "construction industry" "sustainable development" "social development", using "and" to combine each two keywords to search. The identified literature was synthesized and organized into summary tables. A flowchart outlining the literature search process is provided in Figure 1.

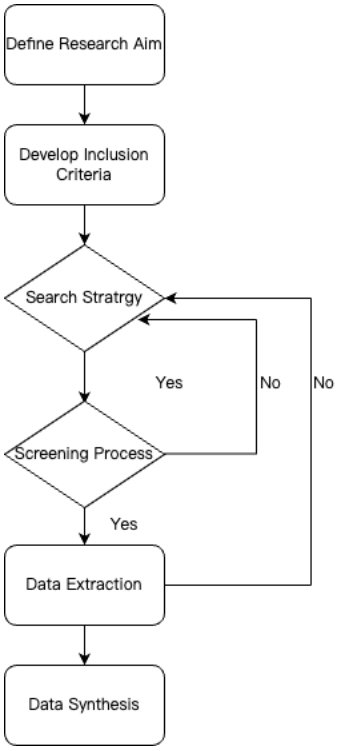


Figure 1. The process of literature search

Table 1
*Search Strategy by Boolean operators*

| Database | Keywords | Search period |
|---|---|---|
| Scopus | [construction and demolition waste management] and [social impact] | 2009-2024 |
| PubMed | [social impact] and [construction industry] | 2009-2024 |
| Web of Science | [construction and demolition waste management] and [sustainable development] | 2009-2024 |
| Google Scholar | [construction industry] and [social development] | 2009-2024 |

*Develop Inclusion Criteria*

This research is focused on studies related to C&D waste management, specifically targeting the development of construction businesses while excluding the broader industry. The study emphasizes socially relevant aspects of waste material management, including societal impacts, environmental effects, and contributions to social sustainability. Research that does not address these social attributes is excluded from the search criteria. The methodology prioritizes practice-oriented approaches, such as empirical research and case study analysis (Omarova & Khalepo, 2023). Additionally, studies lacking rigour are excluded to ensure the inclusion of high-quality, relevant research, providing a robust theoretical foundation for this study.

*Data Extraction and Analysis*

The data extraction process involved systematically collecting key information from each selected research (Ranney et al., 2015). This information was categorized into core areas,

including authors, geographical location, year of publication, study methodology, key findings, and study limitations. The extracted data were then summarized and presented in a table. Following extraction, the analysis focused on synthesizing the findings to facilitate comparison across studies. The analysis method is thematic analysis, this process involves identifying recurring themes related to the social impacts of C&D waste management, categorizing them accordingly, and classifying the studies based on these themes for further categorical analysis (Clarke & Braun, 2017). The aim was to provide a thorough and comprehensive analysis of the social impacts of C&D waste management from multiple perspectives, while also offering guidance for future research in this field.

The data will be summarized and analyzed across two primary dimensions: one highlighting the societal benefits of construction and demolition (C&D) waste management, and the other addressing the challenges it poses to society. Under these overarching categories, the analysis is further divided into sub-themes to capture the nuanced impacts of C&D waste management. The beneficial aspects explore areas such as improved community health and safety, enhanced workforce skills through training, and contributions to social equity and sustainability. Conversely, the challenges focus on issues such as inadequate stakeholder engagement, health risks for workers and communities, and disparities in the distribution of social benefits. These analyses are systematically organized and presented in tabular format, providing a clear and structured overview of the findings.

The analysis focuses on two key dimensions: the social benefits of C&D waste management and the challenges it presents. These dimensions are further refined into sub-themes to detail the multifaceted impacts. Benefits include improvements in community economic development, environmental improvement, social awareness development and advancements in social equity and sustainability. Challenges, by contrast, C&D waste management implementation, urban development and generation of C&D waste, and lack of practical application of knowledge of C&D wastes by the public
. The findings are systematically summarized and presented in tabular format to ensure clarity and facilitate comprehensive understanding.

**Social Benefits of C&D Waste Management**

*Community Economic Development*

Community economic development is an important part of society's progress. Recycling C&D wastes contributes to the development of a circular economy for the whole society. For example, Purchase et al. (2021) emphasize that the reuse and recycling of industrial waste reduces waste management costs and promotes the production of commercially valuable by-products. This is in line with the principles of a circular economy, whereby C&D wastes are treated as a resource. Recycling C&D wastes and repurposing these wastes significantly reduce reliance on landfills, curbing greenhouse gas emissions while fostering innovation and economic growth in recycling technologies. This transition aligns with sustainability goals and paves the way for a more resource-efficient and environmentally conscious society.

*Environmental Improvement*

Recycling C&D waste is a key strategy for achieving environmental improvements, as it can significantly reduce carbon emissions and support global sustainable development goals. A Life Cycle Assessment (LCA) was used by Wang et al. (2022) to highlight the environmental

benefits of recycling materials such as concrete, bricks, steel, timber, and mortar, in line with circular economy principles, to minimize landfill use and improve resource efficiency. Grey models are used to predict waste generation to enable targeted and predictive management strategies. Supported by regulatory policies and economic incentives, these practices not only mitigate environmental impacts but also improve the sustainability of the construction industry. By integrating these approaches, construction waste recycling becomes an important component of environmentally sustainable urban development.

*Social Awareness Development*

As awareness of the hazards associated with C&D wastes grows, public understanding of their risks and the importance of recycling is expected to increase. Oliveira et al. (2019) indicate that inhalation of nanoparticles, such as magnetite and titanium dioxide, poses significant respiratory and systemic health risks. Highlighting the dangers of C&D wastes, studies advocate for enhanced waste management regulations, improved nanoparticle monitoring and control, and adopting sustainable practices, including safe waste recycling. Capacity-building programs targeting C&D waste management professionals and municipal workers can strengthen safe treatment and disposal methods, while collaborations with environmental organizations, academia, industry, and local governments have the potential to drive innovation and improve infrastructure. These coordinated efforts can foster greater social awareness of construction waste disposal, mitigate environmental and health impacts, and promote a culture of sustainability and responsibility.

*Social Equity and Sustainability*

Engaging stakeholders in C&D waste management fosters greater equity and sustainability by leveraging diverse perspectives and expertise. Effective strategies emphasize government oversight, economic incentives, and stakeholder collaboration, supported by advanced technologies. Governments play a pivotal role by providing subsidies, enforcing penalties, and implementing policies that promote waste reduction and recycling. Stakeholders—including researchers, policymakers, environmentalists, practitioners, and local authorities—are integral to developing best practices and adapting strategies to real-world challenges (Aslam et al., 2020). This collective approach maximizes efficiency in C&D waste management, advancing societal sustainability and equity.

Table 2
*Summary Social Benefits of C&D Waste Management*

| Author, Year | Geographical Focus | Methodology | Key Findings | Limitations |
|---|---|---|---|---|
| Purchase et al. 2021 | UK, Netherlands, Malaysia, Denmark | Qualitative method | Improved environmental, social economic, and durability characteristics of the construction activities | Limited to explore the monetary of recycling C&D waste |
| Wang et al. 2022 | China | Mix-method | Waste recycling reduces carbon emissions and promotes social sustainable development | Limited research assumptions |
| Aslam, Huang, and Cui 2020 | China and USA | Qualitative method | Stakeholder engagement helps to build social equity and implement circular economy | Limited to specific regions |
| Oliveira et al. 2019 | Southern Brazil | Quantitative method | Improve social awareness of the impacts of unsustainable C&D waste management | Limited research sample |

**Social Challenges of C&D Waste Management**

*Barriers in C&D Waste Management Implementation*

Barriers to implementing C&D waste management arise from weak regulatory frameworks and enforcement, which undermine compliance and create inconsistencies in industry standards and material treatment. Financial limitations further impede the establishment and maintenance of infrastructure essential for waste treatment, recycling, and disposal (Al-Otaibi et al., 2022). Overcoming these challenges requires a multi-agency approach to strengthen regulations, improve enforcement, and secure adequate funding and resources, ensuring the development of sustainable and efficient waste management systems.

*Urban Development and Generation of C&D waste*

Social challenges in C&D waste management are amplified by rapid population growth, which drives urban expansion and increases waste generation. Key challenges include public resistance to waste management efforts, limited community awareness about proper disposal practices, and insufficient engagement in recycling used building materials (Sharma & Jain, 2020). Additionally, restricted access to study and practice knowledge of C&D wastes, combined with the pressure on social infrastructure in expanding urban areas, significantly hampers the effectiveness of waste management systems.

*Lack of Practical Application of Knowledge of C&D Wastes by the Public*

A key societal challenge in managing construction and demolition (C&D) waste is the lack of public awareness about recycling, driven by insufficient engagement in sustainable practices. This leads to improper disposal, non-compliance, and environmental harm (Debrah, Vidal & Dinis, 2021). Addressing this issue requires collaborative efforts, including targeted education,

hands-on training, and community engagement, to promote recycling awareness and foster sustainability.

Table 3
*Summary Social Challenges of C&D Waste Management*

| Author, Year | Geographical Focus | Methodology | Key Findings | Limitations |
|---|---|---|---|---|
| Al-Otaibi et al. 2022 | Egypt, Ghana, UK, and USA | Mix-method | Lack of law enforcement, regulation, and financial constraints represent major barriers to C&D waste management | Limited number of respondents |
| Sharma and Jain 2020 | 59 developed and developing countries | Qualitative method | C&D wastes have a positive correlation with the population explosion | Reliance on Secondary Data |
| Debrah, Vidal, and Dinis 2021 | Developing countries | Quantitative method | Low public awareness of recycling C&D wastes due to lack of practice | Environmental bias in the selected studies |

**Sustainable Development of C&D Waste Management**

*Tax Reforms Improve the Development of C&D Waste Management*

Reforming public tax policies can integrate economic incentives with environmental and social objectives to promote sustainable development in C&D waste management. Tax credits could incentivize the adoption of recycled materials, decrease reliance on landfills, and enhance funding for waste management infrastructure. These measures foster environmental sustainability by conserving natural resources and reducing pollution while also advancing social benefits such as fostering community engagement and creating green job opportunities (Fried et al., 2021). Moreover, improving waste management systems for building materials can drive innovation in recycling technologies and support circular economy models. Tax policy reforms can significantly contribute to global sustainability in managing used and end-of-life construction materials by addressing economic, environmental, and social dimensions.

*Sustainable Development of C&D waste Management by Delphi Method*

Sustainable management of C&D wastes requires a comprehensive approach integrating the Delphi Method, Fuzzy Sets, Analytical Hierarchy Process (AHP), and Network Analysis (ANP). This integrated strategy optimizes waste management by promoting waste reduction, minimizing environmental impact, and encouraging material reuse and recycling, fostering a circular economy (Ameyaw et al., 2016). By engaging stakeholders in the decision-making process, the approach balances environmental protection, economic efficiency, and social equity, ensuring that waste management benefits both the environment and society.

*Emerging Technologies Enhance Sustainable C&D Waste Management*

Emerging technologies are pivotal in advancing sustainable C&D waste management. Innovations such as artificial intelligence-driven sorting systems and mobile shredders enable more efficient on-site material separation and processing, enhancing recycling outcomes. The development of smart, biodegradable materials aims to produce waste that is either easily recyclable or naturally degradable, reducing environmental impact. Additionally, big data analytics plays a key role in predicting waste generation and optimizing management strategies (Wang et al., 2023). Together with supportive policies and regulations, these technological advancements significantly contribute to the sustainability of C&D waste management practices.

Table 4
*Sustainable development of C&D waste management*

| Author, Year | Geographical Focus | Methodology | Key Findings | Limitations |
|---|---|---|---|---|
| Fried, Novan, and Peterman 2021 | USA | Quantitative method | Encouragement of the development of C&D waste management by the public through tax policies | Tax policies are not refined |
| Ameyaw et al. 2016 | China | Qualitative method | Combining Delphi with fuzzy sets, AHP and ANP solves the problem of ambiguous and imprecise management of C&D waste management | Focus on specific regions |
| Wang et al. 2023 | China, India, Australia, USA, and UK | Qualitative method | Emerging technologies are driving the development of C&D waste management | Data Constraints |

**Discussion**

This research focuses on an overview of the social impact of C&D wastes in the construction industry. The social benefits of C&D waste management are that recycling C&D waste contributes to a circular economy, reduces costs, and promotes valuable by-products, in line with sustainable development goals. Recycling practices significantly reduce carbon emissions and support global sustainable development goals, and LCA and grey models play a vital role in environmental benefits and predictive management. As the C&D waste management evolves, the awareness of the risks associated with them. Stakeholder engagement is critical to developing equitable and sustainable C&D waste management, and government oversight, economic incentives, and synergies between sectors are key to developing best practices and adapting strategies to advance C&D waste management. As the sector grows, it can also provide more employment opportunities and alleviate social pressures.

However, the development of C&D waste management is accompanied by social challenges. Currently, society's management of the practical application of C&D wastes to the public is relatively weak. There is no perfect regulatory framework, and financial constraints, resulting in a lack of public awareness of the recycling of C&D wastes. Population growth has also led to accelerated urbanization, which has exacerbated the generation of C&D wastes, and the

practice and speed of recycling C&D wastes have not been well matched to the development of the construction industry.

The development of C&D waste management has also contributed to the sustainability of society. Some countries have begun to use tax policies to incentivize the development of recycling C&D wastes, involving the public and leveraging the power of society. At the same time, there are also many researchers studying the C&D waste management, using the combination of the Delphi method and AHP to build a more comprehensive management system and promote the development of C&D waste management. With the progress of development, the recycling technologies of C&D wastes are also improving, and the development of artificial intelligence, 3D printing and other technologies also promote the development of C&D waste management.

*Research Gap*

The research's scope is limited by its regional focus, which overlooks diverse social impacts in other areas, restricting its global applicability. While it highlights the relationship between C&D waste management and economic development, it lacks an in-depth economic analysis. Emerging technologies are mentioned but not explored in detail regarding their integration into existing systems. The absence of long-term evaluations leaves the ongoing social and environmental impacts of C&D waste management strategies unaddressed. Additionally, data limitations point to the need for future research to adopt more comprehensive and standardized data collection methods for greater reliability and applicability.

**Future Research**

Future research could examine cultural, economic, and policy factors shaping C&D waste management strategies. Analyzing the industry's potential to generate green jobs and drive local economic development is crucial. Technological advancements are essential for supporting material recycling, and breakthroughs could accelerate industry growth, offering avenues for in-depth exploration of emerging technologies. Public participation is vital, necessitating studies on education, policy innovation, and regulatory models to enhance engagement. Longitudinal researches could comprehensively assess environmental, economic, and social impacts, contributing to sustainability and equitable global development in waste management practices.

**Conclusion**

This systematic review analyzes the social impacts of C&D waste management, emphasizing its potential benefits, challenges, and strategies for fostering sustainable development. Prominent benefits include advancing a circular economy, reducing waste management costs, mitigating greenhouse gas emissions, enhancing resource efficiency, and fostering social equity through stakeholder collaboration and regulatory oversight. Nonetheless, progress is hindered by challenges such as inadequate regulatory frameworks, financial limitations, urbanization-driven increases in waste generation, and low public awareness. Strategies for sustainable development prioritize tax policy reforms, the adoption of emerging technologies such as AI-driven sorting systems, and integrated management approaches to enhance recycling efficiency and mitigate environmental impacts. It has been analyzed that sustainable C&D waste management can be achieved through a combination of regulatory reforms, emerging technologies and collaborative stakeholder engagement in the future development

of used and end-of-life building materials management. This is essential for promoting sustainable social development, improving environmental quality, fostering economic growth and contributing to social progress. The transition of the construction industry to a circular economy is not only feasible but also necessary, and requires a concerted effort from all sectors of society to realize its full potential.

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