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Stakeholders and activities in reverse supply chains for construction and demolition waste: a literature review

Stakeholders e atividades em cadeias de suprimentos reversas de resíduos de construção e demolição: uma revisão da literatura

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ABSTRACT

Construction and demolition waste (CDW) constitute a significant environmental and socio-economic challenge, particularly in developing countries where rapid urbanization and inadequate waste management infrastructure exacerbate negative impacts. The construction industry, a major contributor to global pollution, generates a lot of waste, impeding the transition to a circular economy and sustainable urban development. In this context, reverse supply chains (RSCs) present a promising approach to improve CDW management by integrating stakeholders and optimizing resource recovery. This study aimed to review the literature until July 2024 on RSC for CDW and to identify and characterize the main stakeholders involved and their typical activities. Employing a systematic literature review (SLR) methodology, an initial search identified 89 articles in the Scopus, Web of Science, and ScienceDirect databases. After the selection process, 58 articles were retained and analyzed in the subsequent stages of the SLR. The findings reveal a diverse taxonomy of stakeholders, including generators, reclaimers, and those responsible for final disposal, each fulfilling distinct roles within the RSC. Essential activities identified include integration of RSC processes, regulatory compliance, and material recovery, while notable gaps persist in physical and technological infrastructure and environmental training. Theoretically, this study organizes and systematizes fragmented knowledge on RSC for CDW, highlighting underexplored areas such as the allocation of stakeholder responsibilities. Practically, the results underscore the

RESUMO

Os resíduos de construção e demolição (RCD) configuram um desafio ambiental e socioeconômico relevante, sobretudo em países em desenvolvimento, onde a urbanização acelerada e a infraestrutura de gestão de resíduos ainda incipiente intensificam os impactos negativos. O setor da construção civil, grande responsável pela poluição global, gera volumes expressivos de resíduos, dificultando a transição para uma economia circular e um desenvolvimento urbano sustentável. Nesse cenário, as cadeias de suprimentos reversas (CSR) representam uma estratégia promissora para aprimorar a gestão dos RCD, por meio da integração de *stakeholders* e da otimização da recuperação de recursos. Este estudo revisou sistematicamente a literatura até julho de 2024 sobre CSR para RCD, com o objetivo de identificar e caracterizar os principais *stakeholders* envolvidos e suas atividades típicas. Adotou-se a metodologia de revisão sistemática da literatura (RSL), por meio da qual foram inicialmente levantados 89 artigos nas bases Scopus, Web of Science and ScienceDirect. Após a seleção, 58 artigos foram considerados nas etapas seguintes da RSL. Os resultados revelam uma taxonomia diversificada de *stakeholders* como geradores, recuperadores e responsáveis pela destinação final, cada um com funções específicas na CSR. Destacam-se atividades essenciais como integração de processos, atendimento regulatório e recuperação de materiais, embora persistam lacunas em infraestrutura física, tecnológica e capacitação ambiental. Teoricamente, o estudo organiza e sistematiza o conhecimento ainda fragmentado sobre CSR para RCD, salientando lacunas relacionadas à definição de

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need for strengthened public policies and enhanced collaboration among stakeholders to promote recycling and reuse. By compiling and analyzing current research, this study provides a foundation for future investigations and supports the advancement of circular economy practices in the construction industry.

Keywords: reverse logistics; waste management; circular economy; sustainability; construction industry.

responsabilidades. Na prática, aponta a necessidade de políticas públicas fortalecidas e maior articulação entre *stakeholders* para ampliar a reciclagem e a reutilização. Ao consolidar o conhecimento atual, o estudo oferece subsídios para futuras pesquisas e para o avanço de práticas circulares na construção civil.

Palavras-chave: logística reversa; gerenciamento de resíduos; economia circular; sustentabilidade; setor de construção.

Introduction

Climate change is exacerbating the challenges faced by the construction industry, notoriously one of the biggest contributors to global pollution. Specifically, construction and demolition waste (CDW) accounts for around a third of the total waste generated worldwide, with particularly severe implications in developing countries due to rapid urbanization and a lack of suitable waste management infrastructure (Etinay et al., 2018; Alencar et al., 2023). CDW is the "waste generated in the construction, renovation, repair, and demolition of civil works, including those resulting from the preparation and excavation of land" (Brasil, 2010). The construction industry plays a fundamental role in the development of civilization. However, its growth has introduced significant challenges for waste management due to the large volumes of waste it generates. It is estimated that approximately 44 million tons of CDW have been generated in Brazil in 2023 (Abrema, 2024).

Environmental impacts include contamination of soils and water bodies, while socio-economic impacts obstruct the development of an efficient circular economy (CE). This context highlights the urgent need for CE models that integrate technological innovations and renewed public policies to promote sustainable management of CDW and strengthen socio-economic resilience through more sustainable practices (Silva et al., 2015; Alhawamdeh et al., 2024; Silva et al., 2021; Gomide et al., 2024).

Failure to consider the wider implications of economic development has led to a global environmental crisis driven partly by the waste of material resources and the accelerated rate of CDW generation around the world (Sáez and Osmani, 2019). Effective waste management has become a necessity, in the face of the depletion of natural resources and raw materials, as well as the increase in pollution caused by waste from construction projects (Kadaei et al., 2023).

In Brazil, CDW management shows great challenges, such as low recycling rates and cultural resistance to sustainable practices. Existing legislation, such as CONAMA Resolution 307/2002 and the Brazilian Solid Waste Policy (BSWP) (Law No. 12.305/2010 [Brasil, 2010]), has proved insufficient to address these challenges, often resulting in inadequate disposal practices that aggravate environmental and socio-economic impacts (Brandão et al., 2023; Sajid et al., 2024). Article 9 of the PNRS provides guidelines for waste management, which shows the following order of priority: non-generation, reduction, reuse, recycling, treatment of solid waste, and environmentally proper final disposal of waste (Brasil, 2010).

The main barriers to proper CDW management include a lack of effective legislation and government incentives (Munaro and Tavares, 2022), financial constraints (Faro et al., 2024; Silva et al., 2024), and insufficient understanding of CE principles (Munaro and Tavares, 2022). Technical, economic, and legal factors hamper efforts to reduce CDW (Silva et al., 2024). The lack of accurate data on waste generation and inadequate public policies hinder progress (Domingues and Nunes, 2024; Faro et al., 2024). However, there are opportunities for cost savings in construction projects and environmental benefits through the reuse and recycling of CDW (Domingues and Nunes, 2024). To overcome these barriers, researchers recommend legislative changes, economic incentives, increased environmental awareness (Domingues and Nunes, 2024), and the establishment of public–private partnerships (Munaro and Tavares, 2022).

The implementation of an integrated waste management and information system is important for the transition to a CE in the construction industry (Munaro and Tavares, 2022). To overcome the obstacles, all stakeholders need to work together and share information (Hosseini et al., 2015). One alternative technique adopted to address these challenges is the implementation of concepts related to reverse logistics (RL) (Kadaei et al., 2023). RL is mainly concerned with the operational flows of returned products and materials, considering activities such as collection, transport, sorting, etc., in order to promote recovery and proper disposal (Martins et al. 2022; Melo et al. 2022). A more comprehensive management tool is the reverse supply chain (RSC), whose application goes beyond logistical control, involving strategic aspects that directly influence the competitiveness of companies in the global market (Socca Junior, 2024). In contrast to RL, the RSC extends this perspective to a strategic and collaborative approach, integrating stakeholders and processes to ensure recovery and reinsertion of materials into the production cycle. Studies show that collaboration and information technology improve RL performance, reinforcing the strategic role of RSC (Campos et al., 2020). Recent reviews highlight collaboration and integration as critical themes in RSC (Che Hassan and Osman, 2025), while successful implementation depends on strategic partnerships and managerial commitment (Mbago et al., 2025).

In this collaboration and integration context, the PNRS defines shared responsibility for the life cycle of products as the set of individualized and interlinked duties of manufacturers, importers, distributors and traders, consumers, and holders of public urban cleaning and solid waste management services (Brasil, 2010). In other words, as well as defining the stakeholders who generate the waste, it also assigns them the responsibility of properly disposing of the waste they generate.

Despite its importance, little attention has been paid to the interaction or synergy among stakeholders in CDW management (Barakat and Srour, 2023). Capturing and sharing knowledge will be beneficial for everyone involved and will improve the general acceptance of RL (Chileshe et al., 2016). Thus, this research focuses on the identification of information and development of knowledge involved in the RSC for CDW. To address it, the central research question that guided the study was: What is the current research landscape on RSC for CDW?

Understanding RSC in the construction industry is essential for developing effective CDW management strategies and plans that support the transition to CE, while considering the roles of all stakeholders involved throughout the waste life cycle.

Research Method

The method used to carry out this research consisted of a systematic literature review (SLR), a useful approach for understanding the information gathered from a compilation of studies carried out at different times, places, and contexts, but which deal with the same subject. This method identifies divergent and/or similar results and highlights themes that still need more evidence, helping to guide future studies (Linde and Willich, 2003). According to Tranfield et al. (2003), the prototype of an SLR originated from the systematic review methodology used in the medical sciences and was adapted to the context of this research. The SLR is a tool to seek evidence in research on sustainability, CE, RSC, and logistics (Melo et al., 2021; Martins et al., 2022; Nunes et al., 2023).

The process followed a staged approach. The first stage consisted of a preliminary review, which included planning and defining the research protocol, as well as establishing the parameters and guidelines for the article search. The second stage—article acquisition—involved searching academic databases using the previously defined search string. The article processing, the third stage, involved selecting articles to be included and applying defined inclusion and exclusion criteria. In the fourth stage, data were extracted from the selected articles according to the parameters established in the research protocol. Finally, in the fifth stage, the extracted data were subjected to analysis and discussion, with the aim of identifying patterns, relevant results, and gaps in the literature on the stakeholders and activities involved in RSC for CDW. These steps ensured a structured and rigorous approach to the review of current research, providing a detailed understanding of the topic.

The preliminary review consisted of a preliminary search in one or a few databases, among those possibly considered, examining articles on the subject. This research identified the search terms most aligned with the objective of the research, as well as supported to define the inclusion and exclusion criteria and the parameters for data extraction. These steps were established after determining the research scope and formulating the research questions (RQs). The research protocol, shown in Table 1, consolidates the search terms, parameters, and inclusion/exclusion criteria.

After defining the research protocol, the article acquisition stage involved conducting standardized searches in the Science Direct (SD), Scopus, and Web of Science (WoS) databases using the search string specified in the protocol. The articles found in each database had their titles copied and organized in a spreadsheet. Duplicate and not accessible articles were excluded. The remaining articles underwent a screening process that included reviewing titles, abstracts, keywords, and, when necessary, the introduction and conclusion sections to assess their relevance to the central research theme, based on the inclusion and exclusion criteria outlined in the research protocol.

Table 1 – Research Protocol.

Search terms	Reverse logistics; reverse supply chain; construction and demolition waste; demolition waste; construction industry; stakeholders
Boolean operator	OR, AND
Database	ScienceDirect (SD), Scopus, Web of Science (WoS)
Inclusion Criteria	Talk about any aspect related to reverse supply chains or networks for construction and demolition waste
Exclusion Criteria	Do not in any way address reverse supply chains or networks for construction and demolition waste
Parameters	Stakeholders mentioned; activities assigned to stakeholders
Language	English
Document types	Research and review articles
Research period	Up to July 2024
Search string	(TITLE-ABS-KEY (“Reverse Logistics” OR “Reverse Supply Chain”)) AND (TITLE-ABS-KEY ((“construction and demolition waste” OR “demolition waste” OR “construction industry”)) AND (ALL (stakeholders))

The remaining papers formed the list of classified articles and were read in full to extract information relevant to achieving the objectives of this research. To guide the study, two key RQs were considered: Which stakeholders participate in reverse supply chains for construction and demolition waste? (RQ1) and What activities do these stakeholders perform? (RQ2).

The analysis of the results supported tracing the evolution of research on the topic and revealed key gaps. The study also presents theoretical and practical contributions and discussions based on the findings, along with proposals for future research, thereby fulfilling the overall objective. Figure 1 presents, in a PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) flow diagram, the sequence of activities that comprised the SLR selection process.

Results and Discussion

As shown in Figure 1, the final list from the SLR comprised 58 articles, and the results of the data extraction stage are presented below.

Taxonomy of Stakeholders in RSC for CDW

To check the stakeholders cited in the literature, according to RQ1, the articles were read in full. Initially, the stakeholders were extracted from the articles exactly with the names as they were found in the texts. Because of the variety of names identified, groups were subsequently defined where they fit in, so a standardization was proposed for the nomenclature (taxonomy) of the stakeholders (see Table 2).

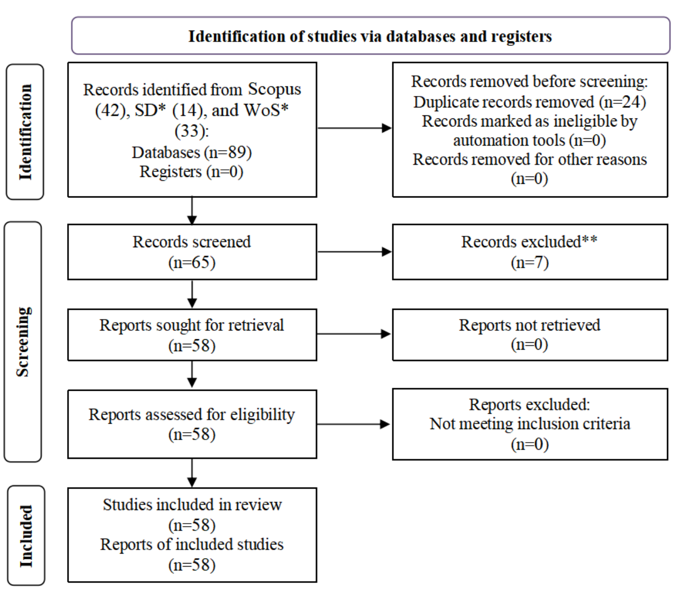

Figure 1 – PRISMA flow diagram of study selection process
Source: the authors (2025).
*SD: ScienceDirect; WoS: Web of Science. **Excluded for not meeting inclusion criteria or could not be accessed.

The results generated from this extraction were sorted into a new parameter, called Categorized Stakeholders, in which the standardization was made considering the following categories of stakeholders. The stakeholders involved in CDW management can be classified into different groups, each with their specific functions. Generators are the stakeholders responsible for generating both recoverable (waste) and non-recoverable (tailings) CDW. Reclaimers, on the other hand, work to recover CDW by carrying out activities such as reuse, repair, refurbishment, remanufacturing, and recycling. The responsible for final disposal are those who ensure the proper disposal of tailings.

The government, at different levels (federal, state, and municipal), is responsible for creating laws and regulations, overseeing, applying credits, financing, subsidies, penalties (fines), and fees necessary for the proper management of CDW.

Sellers are stakeholders involved in marketing recovered CDW, while consumers buy and reuse these materials. It is worth noting that by using recovered CDW, consumers are likely to generate new CDW, making them generators as well. Logistics service providers include stakeholders who handle the collection, transportation, inspection, segregation, sorting, storage of CDW, and redistributing recovered CDW, as well as forwarding tailings to proper disposal sites. Processors are the stakeholders involved in preparing CDW for recovery or final disposal.

The stakeholders identified in the literature were organized according to the frequency of citations in the 58 articles selected. Generators were the most cited, with 94.83%, followed by the government, with 77.59%. Those responsible for final disposal were mentioned in 53.45%, reclaimers in 46.55%, logistics service providers in 36.21%, processors in 27.59%, and consumers in 20.69%. Lastly, sellers were the least mentioned, with 18.97%. The results indicate that generators and the government are the most prominent stakeholders, reflecting their importance in the management and implementation of RSC for CDW.

Generators play a key role in waste management, while the government is important in promoting public policies, regulations, and incentives for sustainable practices. The predominance of generators and government in the analyzed literature reflects the concentration of practical and regulatory responsibilities. Generators are directly associated with initial segregation (gatekeeping) and the volume of waste produced, yet recent studies highlight the lack of incentives and the economic barriers that hinder more sustainable practices (Faro et al., 2024; Silva et al., 2024). Government, in turn, emerges as an essential stakeholder in the creation of public policies and enforcement, although regulatory weaknesses persist, particularly in developing countries (Brandão et al., 2023; Sajid et al., 2024). A comparison with international studies (e.g., Hosseini et al., 2015; Chileshe et al., 2018) shows that, although the role of government is central across different contexts, the absence of effective mechanisms to integrate policies and practices limits progress toward CE models.

Table 2 – Categories and original stakeholders.

Categorized stakeholders	Original stakeholders*
Generators	Construction/demolition industry[1]; Primary raw materials market[1]; Construction contractors[2]; Suppliers[3,9,22,32,34,41,47,53,54,55,57]; Manufacturers[3,23,25,27,41,45,46,48,50]; Sources of supply[4]; Construction industry[5]; Demolition industry[4]; Construction companies[6,17,19,20,21,22,25,41,42,54,55]; Sustainability manager[6]; Construction professionals[7,35,40]; Demolition and deconstruction service providers[7]; Contractors[7,8,9,10,11,13,16,27,28,34,37,45,48,49,50,57]; RCD suppliers[7]; Designers[7,10,13,28,49,57]; Owners[8,41,46]; Building materials distributors[8]; Clients[8,13,19,21,28,31,34,46,54,57]; Construction contractors[14]; Construction project managers[15]; Waste management companies[15]; Developers[20,22,28]; Engineers/Inspectors[37]; Architects[11,17,28,37,39,46,47,51]; Consultants[22,37,57]; Public administration[38]; Producers of insulation materials[39]; Project owner[39]; Construction companies[39,42]; Construction associations[39]; Deconstruction companies[39]; Construction industry/ Construction companies[41]; Regional separation center/Waste recovery company[42]; CDW generation points[42]; Wreckers[10,24,28,29,34,35,46,58]; Designer[28,31,40,46,47,48,50,51,56]; Operators[56]; Manual handling workers[30]; Logistics service providers[30]; Laboratory technicians[30]; Retailers[30]; Plant/ equipment/machinery specialists[30]; Researchers[51]; Construction investigators[40]; Building inspectors[40]; Builders[10,26,32,35,40,47]; Demolition/salvage subcontractors[40]; Contractors/subcontractors[22]; Engineers[39,46,47]; Deconstruction companies[39]
Reclaimers	Waste management facilities[1]; Recycling,reuse and disposal facilities[2]; Recyclers of special materials[2]; Manufacturers of manufactured goods[3]; Recycling plants[5]; Manufacturing businesses[6]; Manufacturers[3,11]; Recyclers[27,28,30,31,35,55]; Remanufacturers[27]; Remanufacturer[27]; CDW recycling companies[33]; CDW recycling company/CDW treatment plants[16]; CDW recycling facilities[45]; Processing facilities[45]; Regional CDW sorting centers[43]; Waste picker cooperatives and local RSC for CDW[43]; CDW recycling/remanufacturing centers[43]
Responsible for final disposal	Landfill operators[1,5]; Landfills[16,21,27,28,31,36,37,43,44,45]; Disposal center[15]; Landfill owners[56]; Landfill facilities[39]; Landfill[53]; Landfill[32]; Landfill operators[1,35]
Government	Government of the EU Member States[1]; Government[2,3,4,7,8,9,14,15,21,26,27,30,31,33,34,35,37,42,43,45,48,50]; Municipalities[4]; Public authorities[4]; Authorities[13,18,39]; Certification organizations[39]; Government agencies[34,51]; Public administration[38]; State and local government agencies[32]; Policy makers[11,22,40,47,57]; State environmental agencies[42]; Federal environment ministry[42]; Senior environmental protection office[42]; Municipal administration[42]; Legislator/governmental organizations[56]
Sellers	Secondary raw materials market[1]; Secondary markets[4,18]; Retail outlets/Waste markets[20]; Building materials wholesalers[17]; Traders/Suppliers[26]; Traders/Consultants[28]; CDW seller[12]; Marketing administrative staff[30]
Logistics service providers	Waste collectors[2,23]; Digital platform developers[2]; Central storage[3]; Private companies[3]; Collection centers[4,52]; CDW transporter[12]; Supply chain managers[9]; Distributors[23,39]; Warehouses[23]; Logistics service providers[23,54,55]; Transporters[39]; Independent consultants/advisors[39]; Waste transport organizations[42]; Waste transport companies[43]; Material transport operators[56];
Processors	Waste assessment company[5]; Collection centers[4]; Waste processors[18,24,26,29,34,58]; Sorting and distribution centers[53]; Collection centers[15]; Sorting companies[39]; Waste managers[29]
Consumers	Customers[3,32]; Consumers[4]; Public sector customers[26]; Private sector customers[26]; Secondary market end users[85]; Points of consumption[43]; Other consumers[42]; Points of potential demand[44]

*References considered in the SLR: [1]Saez and Osmani (2019); [2]Barakat and Srour (2023); [3]Kadaei et al. (2023); [4]Trochu et al. (2019); [5]Oluleye et al. (2023); [6]Zandee et al. (2022); [7]Chileshe et al. (2016); [8]Sajid et al. (2024); [9]Ambekar et al. (2022); [10]Chileshe et al. (2016); [11]Charef et al. (2021); [12]Costa et al. (2022); [13]Rakhshan et al. (2020); [14]Su et al. (2021); [15]Jahangiri et al. (2022); [16]Pan et al. (2020); [17]Ghailani et al. (2023); [18]Tennakoon et al. (2021); [19]Nguyen et al. (2021); [20]Barakat et al. (2022); [21]Chileshe et al. (2018); [22]Wibowo et al. (2018); [23]Ding et al. (2023); [24]Wijewickrama et al. (2023); [25]Górecki et al. (2019); [26]Tennakoon et al. (2022); [27]Zheng et al. (2022); [28]Wijewickrama et al. (2021); [29]Wijewickrama et al. (2022); [30]Wijewickrama et al. (2020); [31]Jayasinghe et al. (2019); [32]Wijewickrama et al. (2021b); [33]Wu et al. (2022); [34]Wijewickrama et al. (2021a); [35]Jayasinghe et al. (2022); [36]Ahmed and Zhang (2021); [37]Correia et al. (2021); [38]Brandão et al. (2022); [39]Superti et al. (2021); [40]Hosseini et al. (2015); [41]Wibowo et al. (2022); [42]Brandão et al. (2021); [43]Brandão et al. (2023); [44]Yang and Chen (2020); [45]Shi et al. (2019); [46]Charef et al. (2021); [47]Pushpamali et al. (2020); [48]Anastasiades et al. (2023); [49]Rakhshan et al. (2023); [50]Anastasiades et al. (2021); [51]Pushpamali et al. (2020); [52]Rahimi and Ghezavati (2018); [53]Shi et al. (2020); [54]Chinomona and Maconguel (2021); [55]Charef et al. (2022); [56]Shooshtarian et al. (2022); [57]Nguyen and Le (2022); [58]Tennakoon et al. (2023).

Other stakeholders, such as logistics service providers, processors, reclaimers, and those responsible for final disposal, although mentioned less frequently, also play essential roles in the RSC for CDW. Vendors and consumers, although the least frequently mentioned, are vital to the marketing and reuse of recovered materials, closing the RSC loop, with consumers potentially becoming new generators by using the recovered materials. This data highlights the importance of collaboration between stakeholders, applying the principle of shared responsibility to ensure the efficiency of the CDW reverse cycle. Thus, this study contributes by systematizing the relative weight of each stakeholder, revealing a gap in the literature concerning consumers and sellers, who remain marginalized yet are strategic for closing the CDW recovery cycle.

Characterization of the activities of the stakeholders in reverse supply chains for construction and demolition waste

The characterization of activities was also a result of reading the articles in full in order to answer RQ2. Thus, we identify the activities carried out by stakeholders in RSC for CDW mentioned in the literature, relating them to the stakeholders, according to the taxonomy proposed in Table 2. The variety of activities identified was very wide, due to the different contexts applied in each article. Therefore, it was decided to group these activities according to similarity.

The group *Value Recovery/Repair/Remanufacturing/Refurbishment/Recycling/Energy Recovery* involves transforming CDW into new materials or products or generating energy from non-recyclable waste. *Disposal/*

Incineration/Landfilling deals with the final disposal of non-recoverable waste, including landfill disposal and incineration for energy generation. The *Credit/Subsidy/Cost* group refers to government financial incentives, such as credits and subsidies, to support sustainable CDW management practices. *Regulation/Licensing/Legislation* covers the creation of standards and laws to regulate waste management and disposal.

Environmental Education/Awareness/Training involves actions to educate society and professionals about the importance of sustainable CDW management. *RSC Integration* refers to adopting business practices that comply with legislation and promote sustainability. *Transportation/Transfer* and *Receiving/Inspection/Sorting/Classification* groups guarantee the proper flow and treatment of waste, from collection to recycling. *Storage* ensures that waste is properly stored during processing.

The *Return/Collection* group of activities facilitates the reintegration of recyclable materials into the production cycle and their return to the sale point, promoting recycling. *Enforcement/Punishment/Sanction* guarantees compliance with regulations, with fines or restrictions applied in case of violations. Finally, *Waste Monitoring/Traceability* ensures monitoring of CDW from source to final destination, improving management and guaranteeing sustainable practices. Table 3 shows the activity groupings and their relationship with the stakeholders.

The results in Table 3 indicate the activities of *RSC Integration* (75.86%) and *Regulation/Licensing/Legislation* (74.14%) were the most cited in the literature, highlighting their importance in the transition to a sustainable model in the Construction Industry. These percentages reflect the need for robust strategic and regulatory alignment to implement RSC for CDW. *Value recovery/Repair/Remanufacturing/Refurbishment/Recycling/Energy recovery* and *Disposal/Incineration/Landfilling* (both with 51.72%) highlight the importance of waste recovery and proper final disposal of CDW. On the other hand, activities associated with *Physical and Technological Infrastructure* (10.34%) and *Health and Safety* (8.62%) were barely mentioned, indicating an important gap, as these aspects are essential for the effective functioning of the RSC for CDW. The lack of attention to these points indicates the need for more focus and investment in these areas.

The *Environmental Education/Awareness/Training* activity (15.52%) was poorly cited, suggesting the need for greater engagement to promote sustainable practices among stakeholders and society. Furthermore, this lack of initiatives shows great potential for improvement in the current cycle, contributing to increasing environmental performance and compliance with regulations.

Table 3 – Categorized stakeholders and grouping of activities in reverse supply chains for construction and demolition waste.

Categorized stakeholders	Activities groups in RSC for CDW*
Generators	Return/Collection[2,4,10] RSC integration[5,6,7,9,10,15,16,19,20,35,39,40,43,51,56,57] Waste Monitoring/Traceability[28,30,32,37,43,56] Health and safety[24,37] Receiving/Inspection/Sorting/Classification[29,32,52]
Reclaimers	Value Recovery/Repair/Remanufacturing/Refurbishment/Recycling/Energy recovery[1,2,3,5,6,11,14,15,16,22,23,27,28,30,31,32,33,35,39,41,43,44,52,53,55,56] Receiving/Inspection/Sorting/Classification[14]
Responsible for final disposal	Disposal/Incineration/Landfilling[1,4,5,9,14,15,16,18,21,25,26,27,28,31,32,33,35,36,37,39,42,43,44,45,52,53,55,56,58]
Government	Credit/Subsidy/Cost[1,4,6,8,10,14,15,17,20,28,33,37,38,39,40,42,47,48,50,51,53,57] Enforcement/Punishment/Sanction[2,3,7,11,15,17,20,28,38,39,41,42,43,48,50,56,58] Regulation/Licensing/Legislation[1,2,3,4,6,7,8,10,11,14,15,17,18,20,21,22,24,26,27,28,30,31,32,33,34,35,37,38,39,41,42,43,45,47,48,49,50,51,52,53,56,57,58] Waste Monitoring/Traceability[7,13,15,17,24,33,34,39]
Sellers	RSC integration[1,4,8,12,15,16,18,20,23,26,28,30]
Logistics service providers	Transportation/Transfer[2,3,4,9,12,15,19,20,23,25,36,39,42,43,49,52,53,54,55] Return/Collection[19,23,30,39,42,49] Receiving/Inspection/Sorting/Classification[3,23] Storage[19,23,49]
Processors	Receiving/Inspection/Sorting/Classification[4,5,15,18,24,26,29,30,34,39,42,43,44,53,58] Storage[4,15,18,26,39,43,44,53]
Consumers	RSC Integration[3,4,7,12,26,27,29,32,35,42,43,44,55,58]

RSC: reverse supply chains: CDW: construction and demolition waste; *references considered in the SLR: [1]Saez and Osmani (2019); [2]Barakat and Srour (2023); [3]Kadaei et al. (2023); [4]Trochu et al. (2019); [5]Oluleye et al. (2023); [6]Zandee et al. (2022); [7]Chileshe et al. (2016); [8]Sajid et al. (2024); [9]Ambekar et al. (2022); [10]Chileshe et al. (2015); [11]Charef et al. (2021); [12]Costa et al. (2022); [13]Rakhshan et al. (2020); [14]Su et al. (2021); [15]Jahangiri et al. (2022); [16]Pan, Xie and Feng (2020); [17]Ghailani et al. (2023); [18]Tennakoon et al. (2021); [19]Nguyen et al. (2021); [20]Barakat et al. (2022); [21]Chileshe et al. (2018); [22]Wibowo et al. (2018); [23]Ding et al. (2023); [24]Wijewickrama et al. (2023); [25]Górecki et al. (2019); [26]Tennakoon et al. (2022); [27]Zheng et al. (2022); [28]Wijewickrama et al. (2021); [29]Wijewickrama et al. (2022); [30]Wijewickrama et al. (2020); [31]Jayasinghe et al. (2019); [32]Wijewickrama et al. (2021b); [33]Wu et al. (2022); [34]Wijewickrama et al. (2021a); [35]Jayasinghe et al. (2022); [36]Ahmed and Zhang (2021); [37]Correia et al. (2021); [38]Brandão et al. (2022); [39]Superti et al. (2021); [40]Hosseini et al. (2015); [41]Wibowo et al. (2022); [42]Brandão et al. (2021); [43]Brandão et al. (2023); [44]Yang and Chen (2020); [45]Shi et al. (2019); [46]Charef et al. (2021); [47]Pushpamali et al. (2020); [48]Anastasiades et al. (2023); [49]Rakhshan et al. (2023); [50]Anastasiades et al. (2021); [51]Pushpamali et al. (2020); [52]Rahimi and Ghezavati (2018); [53]Shi et al. (2020); [54]Chinomona and Maconguel (2021); [55]Charef, Lu and Hall (2022); [56]Shooshtarian et al. (2022); [57]Nguyen and Le (2022); [58]Tennakoon et al. (2023).

The activities of *Transportation/Transfer* (37.93%), *Return/Collection* (20.69%), *Receiving/Inspection/Sorting/Classification* (36.21%), *Storage* (24.14%), *Monitoring/Traceability of Waste* (24.14%), *Credit/Subsidy/Costs* (44.83%), and *Enforcement/Punishment/Sanction* (31.03%) are essential to ensure reverse logistics (RL). However, these activities have been barely mentioned (less than 50%); a clear definition and attribution of these activities is necessary due to the strong relationship with the efficiency of RSC for CDW.The lack of attention suggests more focus and investment in some RSC activities. The *Environmental Education/Awareness/Training* activity (15.52%) was poorly cited, suggesting greater engagement to promote sustainable practices among stakeholders and society. Furthermore, the lack of initiatives shows great potential for improvement in the current cycle, contributing to increased environmental performance and compliance with regulations.

The activities of *Transportation/Transfer* (37.93%), *Return/Collection* (20.69%), *Receiving/Inspection/Sorting/Classification* (36.21%), *Storage* (24.14%), *Monitoring/Traceability of Waste* (24.14%), *Credit/Subsidy/Costs* (44.83%) and *Enforcement/Punishment/Sanction* (31.03%) are essential to ensure RL. However, these groups of activities were mentioned relatively infrequently (less than 50%). The clear definition and attribution of these activities is necessary due to their relationship with the efficiency of RSC for CDW.

The results confirm that RSC Integration and Regulation/Licensing/Legislation constitute the central pillars of CDW reverse management, which aligns with recent evidence highlighting inter-organizational integration and digital platforms as mechanisms to enhance efficiency, as emphasized by Zheng et al. (2022) and Barakat and Srour (2023). Conversely, the emphasis placed on regulations demonstrates that, without a robust legal framework, it is difficult to establish market conditions for reuse and recycling. In the Brazilian context, the National Solid Waste Policy (Law 12.305/2010 [Brasil, 2010]) already reinforces the prioritization of recycled aggregates in public works, thereby bridging the gap between political discourse and operational practice. A comparison with other reviews (Ding et al., 2023; Che Hassan and Osman, 2025) shows that, although integration and regulation have already been recognized as relevant, there was still no clear systematization of activities by stakeholders. Thus, the present study advances the field by identifying critical gaps such as technological infrastructure, occupational health and safety, and environmental training that remain neglected despite being fundamental to the effectiveness of the CE in the construction industry.

Advances beyond the state of the art

This study goes beyond previous literature reviews on RL and RSC (e.g., Ding et al., 2023; Che Hassan and Osman, 2025) by proposing a structured taxonomy that systematizes both stakeholders and related activities specifically in the context of CDW. Unlike prior works, which generally approached RL practices in a broader manner, our analysis identifies the relative importance of each stakeholder group, revealing the predominance of generators and governments, while also highlighting the marginalization of sellers and consumers despite their strategic role in closing material loops. Furthermore, the grouping of activities demonstrates that integration and regulation remain central to RSC implementation, yet the neglect of technological infrastructure, occupational health and safety, and environmental training underscores critical gaps that are not sufficiently addressed in the state of the art.

Another contribution of this study is its explicit link between stakeholder activities and regulatory frameworks, offering an empirical basis to discuss how national and local policies, such as the Brazilian Solid Waste Policy (Law No. 12.305/2010 [Brasil, 2010]), can be leveraged to foster circular practices in the construction industry. By bridging theoretical gaps and identifying underexplored responsibilities, this review provides a novel foundation for advancing future research agendas and guiding policymakers and practitioners toward more integrated and effective CDW management strategies.

In practical terms, the study offers insights for policymakers and practitioners by showing how the integration of stakeholders and regulatory enforcement can accelerate the transition toward circularity in the construction industry. From a theoretical perspective, it clarifies how the concept of reverse supply chains can be applied to CDW, overcoming the fragmented approaches that dominate current literature.

Conclusion

This study contributes to the field of CDW management by systematically reviewing the role of RSC and identifying the stakeholders, groups of activities, and regulatory aspects that shape their performance. By structuring stakeholders into specific categories and linking them to concrete activities, the research provides a clearer picture of how responsibilities are distributed and how integration is required for effective CDW reverse flows. This systematization addresses an important gap in the literature, which often treats CDW management in general terms without detailing the interdependence between stakeholders and activities.

The findings highlight that, although generators and governments appear as central actors in most studies, other stakeholders, such as sellers and consumers, remain underexplored, despite their potential relevance in closing material loops. Furthermore, the emphasis on regulation and integration confirms the critical role of governance frameworks in fostering sustainable RSC for CDW. By advancing this structured taxonomy, the study not only organizes existing knowledge but also sets the basis for future empirical and conceptual investigations.

Several research avenues remain open. Future studies should explore: i. the dynamics of power, legitimacy, and urgency among stakeholders in CDW reverse chains; ii. the motivations of different groups and the trade-offs that emerge from conflicting interests, as well as the role of public policies in harmonizing them; iii. the connections between activities and their dependencies across the chain, including logistics, recycling infrastructure, material quality, and contamination; iv. the role of certification, incentives, and regulatory barriers; v. the development of performance metrics (KPIs [key performance indicators]) that also capture social impacts; and vi. innovative business models, governance arrangements, and partnerships.

Authors' Contributions

Silva, I.G.: conceptualization, data curation, formal analysis, investigation, methodology, validation, visualization, and writing — original draft. **Martins**, V.W.B.: formal analysis, investigation, validation, and writing — review & editing. **Braga Junior**, A.E.: formal analysis, investigation, validation, and writing — review & editing. **Lima**, R.B.: formal analysis, investigation, validation, and writing — review & editing. **Nagata**, V.M.N.: formal analysis, investigation, validation, and writing — review & editing. **Cardoso**, B.F.O.: formal analysis, investigation, methodology, supervision, validation, and writing — review & editing. **Nunes**, D.R.L.: formal analysis, investigation, methodology, supervision, validation, and writing — review & editing. **Melo**, A.C.S.: conceptualization, formal analysis, funding acquisition, investigation, methodology, project administration, supervision, validation, and writing — review & editing.

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