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Unlocking sustainability through reverse logistics in construction: a systematic literature review

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Abstract

Purpose – The study aims to conduct a holistic review of academic development and identify key research themes on Reverse Logistics (RL) in the construction industry (CI). The review identified key research trends, thematic clusters and existing gaps to broaden understanding of how RL contributes to sustainable development in the built environment.

Design/methodology/approach – A systematic literature review (SLR) was conducted, incorporating bibliometric and content analyses. The Scopus database was used to collect articles covering the period 2000 to 2024. A total of 82 articles were identified and analysed.

Findings – The study found that research on RL in the CI has significantly increased over the past decade, with Australia leading scholar contributions. Four key thematic clusters were discovered: demolition waste management, sustainability, stakeholder-driven decision-making and barriers to implementation. The review also highlighted RL'scontributions in attaining sustainable development goals (SDGs), especially goals 7 and 12. However, limited empirical studies exist; thus, future research is recommended to focus on cross-geographical analyses and material-specific RL strategies.

Originality/value – The study involves a comprehensive bibliometric analysis of research on RL in the CI, which, to the authors' best knowledge, is the first of its kind. In addition, it presents an integrated conceptual framework that provides a comprehensive foundation for implementing RL in the construction sector. This framework reflects clear implications for researchers, practitioners and policymakers seeking to implement sustainable RL practices in the CI.

Keywords Conceptual framework, Construction industry (CI), Reverse logistics (RL), Sustainable development goals (SDGs), Systematic literature review (SLR)

Paper type Literature review

Introduction

The construction industry (CI) is widely acknowledged as a key driver of global economic development. However, the traditional linear economic model of "take, make and dispose" has continued to pose challenges in the management of construction and demolition waste (CDW) and in redirecting the used natural resources back into the supply chain (Benachio *et al.*, 2020). The circular economy (CE) model has emerged as a promising alternative to the traditional linear economic model (Ding *et al.*, 2023). Within the construction sector, the CE focuses on preserving the value of materials and components that would otherwise be destined for

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landfills at the end-of-life (EoL) of a facility by adopting sustainable practices (Joensuu *et al.*, 2020). The concept of reverse logistics (RL) is widely recognised as a key operational mechanism for effectively implementing CE principles (Durdyev and Hosseini, 2020). While CE provides the overarching sustainability paradigm, which aims at closing material and resource loops, RL enables its practical implementation by facilitating the return, recovery, recycling and repurposing of construction materials at EoL (Ali *et al.*, 2023; Ambekar *et al.*, 2022). Therefore, RL is regarded as a fundamental step towards CE, which reduces waste generation and environmental impact while conserving resources and minimising reliance on virgin materials. Given this, both researchers and industry professionals recognise RL as a solution-oriented strategy to close the loop in materials and resources flows across the CI.

The notion of RL has been evolving since the 1980s, initially within the manufacturing industry. According to Rogers and Tibben-Lembke (2001), RL refers to "*the process of planning, implementing, and controlling the efficient, cost-effective flow of raw materials, in-process inventory, finished goods, and related information from the point of consumption to the point of origin for the purpose of recapturing or creating value or proper disposal*" (p. 130). When applied to the CI, RL involves transferring materials from the dismantled facility to new construction sites to recover the value of materials that would otherwise end up in landfills (Wijewickrama *et al.*, 2022a). As a result, the integration of forward supply chains with reverse logistics supply chains (RLSCs) forms a closed-loop supply chain (CLSC) in the CI, aligning with the "cradle-to-cradle" philosophy. A clear example is the management of concrete at the EoL of the buildings, where the demolished concrete is collected through RL channels, processed into recycled aggregates at a material recovery facility (MRF) and subsequently reintegrated into new construction projects as new input materials. In this way, the construction materials continuously circulate between successive building life cycles, reflecting the cradle-to-cradle philosophy facilitated through RLSCs (Chen *et al.*, 2024).

Research on RL has been evolving over the past decade in response to the increasing interest in implementing RLSCs in the CI. While existing studies offer valuable insights to advance the concept in practice, the literature remains largely fragmented. Consequently, many review papers have emerged, aiming to consolidate the growing body of knowledge on RL in the CI, with a particular emphasis on addressing its related challenges. For example, Tennakoon *et al.* (2022) conducted a systematic literature review (SLR) to explore strategies for overcoming external integration issues in RLSCs in the construction context. Similarly, Wijewickrama *et al.* (2021) synthesised existing literature to identify the causes for the inadequate information flow and proposed holistic approaches to improve communication within RLSCs. Although these reviews contribute meaningful findings, they are predominantly focused on a particular barrier to RL adoption and potential solutions to overcome it. Therefore, they fall short of offering valuable insights into the RLSCs in the CI as they do not provide a holistic picture of the area. It remains unclear how RL research in construction has evolved over the past decades. Therefore, this study attempts to conduct a holistic review of the academic development and identify key research themes on RL in the CI. This review is expected to extend previous reviews, through: (1) applying a rigorous bibliometric analysis approach for the study to reveal development trends of RL publications, to quantitatively evaluate the academic influence of journals and countries that publish CE studies and to characterise the structure of CE knowledge; and (2) an in-depth content analysis to provide insights into the key themes of RL research in the CI context. This paper provides an effective reference point for identifying neglected or under-researched areas in RL research. Furthermore, to the best of the authors' knowledge, the paper presents the first bibliometric study in the area, with the focus of offering recommendations to assist with future empirical studies in the field.

RL in the CI

The CI is responsible for approximately 35–40% of global CO_2 emissions and generates 45%–65% of total landfilled waste, while simultaneously utilising vast quantities of natural resources (Chen *et al.*, 2024; Lima *et al.*, 2021). Due to this substantial environmental footprint, achieving sustainability in the CI has become a critical global priority. Within this context, RL offers a practical operational mechanism to mitigate these impacts by enabling the reprocessing of EoL waste and reintegrating the recovered materials into the new construction projects (Wijewickrama *et al.*, 2022a; Correia *et al.*, 2021). Herein, RLSCs, through landfill diversion and material recovery, reduce the excessive need for virgin material extraction and processing, which in turn lowers the energy consumption and associated greenhouse gas emissions (Chen *et al.*, 2024). Furthermore, RL generates economic value through secondary material markets (Tennakoon *et al.*, 2022), while contributing to broader society by facilitating cleaner, more resource-efficient built environments (Pushpamali *et al.*, 2021). Consequently, RL represents a key enabler for investigating sustainability transitions within the CI.

The RLSC in the CI is a complicated process, including a series of operational stages as shown in Figure 1. This supply chain starts with the dismantling of the structure, where a significant portion of recoverable materials, such as concrete, steel, timber and other construction-related waste types, enter the process (Chen *et al.*, 2021). Consequently, RLSCs are predominantly associated with demolition or deconstruction activities, including both residential and non-residential projects where careful demolition and material recovery are critical. In general, demolition companies and subcontractors with whom demolishers are working together are accountable for dismantling, collecting, on-site sorting and transportation of salvageable waste to an off-site MRF while transferring the contaminated waste and waste with no value to authorised landfill sites or dumping sites (van den Berg *et al.*, 2020). On the other hand, waste processors are entitled to carry out waste processing and, in most cases, the marketing of reprocessed products (Wijewickrama *et al.*, 2022a, b). Thus, in general, at least two key stakeholder groups are involved in each of the building dismantling and on-site processing and off-site processing phases in an RLSC in CI, with these organisations having contrasting cultures, interests, capacities and vulnerabilities.

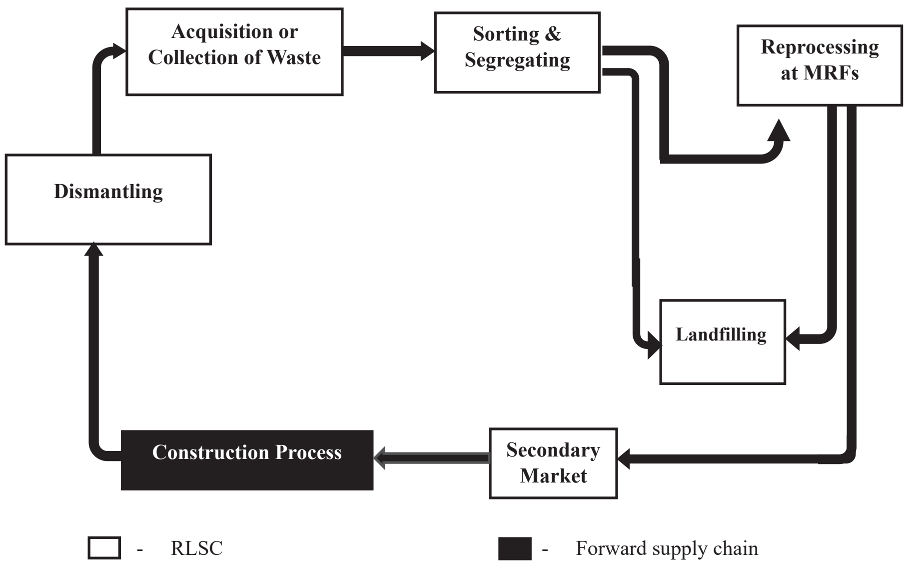

Figure 1. RLSC in CI. Source: Authors' own work

Research method

This study adopted a comprehensive SLR of research on RLSCs in the CI. To achieve the research aim, methods including bibliometric analysis and in-depth content analysis are employed.

Sample source and extraction

The Scopus database was selected for data collection in this study. Compared to the other databases (e.g. Web of Science, Google Scholar, PubMed), Scopus has been used in many recent SLRs as it offers the largest database of abstracts and citations for peer-reviewed articles, with broad subject coverage and reliable quality (Sabour *et al.*, 2023). Scopus also offers faster indexing compared to other major academic databases such as Web of Science and Google Scholar, further establishing it as a major resource for scientific research (Tseng *et al.*, 2019).

Special attention was given to developing the search statement, as overly broad or shallow searches could potentially lose important and relevant papers (Aliu and Aigbavboa, 2023). Previous review studies on RL in the CI have used various related terms for RL as search terms, such as "demolition waste management", "remanufacturing", "closed-loop logistics/supply chain" and "recycling". Even though these terms overlap, there are predominant differences among them. For example, RL focuses on the movement of materials, products and components backward through the supply chain for purposes like remanufacturing, refurbishing, recycling or proper disposal. Demolition waste management, on the other hand, represents a more technical part of the RLSC that primarily focuses on handling, sorting, reprocessing and disposing of debris generated from demolition. Hence, RL is a logistics and supply chain-driven broader concept that goes beyond demolition waste management (Hosseini *et al.*, 2015). In addition, while some previous studies noted that CDW is encompassed within the concept of RL (Brandão *et al.*, 2023; Correia *et al.*, 2021), the inclusion of CDW-related terms in the keyword string would have significantly narrowed, expanded or potentially misled the search. Therefore, to ensure conceptual consistency and to refine the key relevant articles related to the RL in the CI, the search was deliberately done, including keywords that are directly aligned with the concept. As such, the search string applied to article search was: (TITLE-ABS-KEY) ("reverse logistics") OR ("reverse supply*") AND ("construction industry"). These keywords were chosen for their applicability to the context of this study, aiming to provide a comprehensive representation of the trends and patterns of the growing research on RL in the CI. Herein, the "TITLE-ABS-KEY" field indicates article title, abstract and keywords. According to Hosseini *et al.* (2015), the research on RL in the CI started gaining attention in 2000. Therefore, the literature search began from the year 2000 and extended up to 2024, which is the most recent complete year at the time the study was carried out.

Figure 2 illustrates the graphical representation of the comprehensive refinement process followed in the current study based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework. Accordingly, the initial search found 103 articles, which were subjected to a title and abstract review to determine their relevance in accordance with the inclusion criteria shown in Figure 2. Only journal articles and conference papers written in English were considered for the full-text review. During the full paper review, three articles were excluded due to being inaccessible. Consequently, a total of 82 articles were used for the subsequent bibliometric and content analyses.

Research procedure for analysis

To begin with, a comprehensive bibliometric analysis was conducted to assess the overall research landscape on RL in the CI. This type of analysis is commonly used to map existing literature and evaluate research development within a specific field (Wu *et al.*, 2019). The bibliometric analysis in this study was conducted as a quantitative analysis and a co-

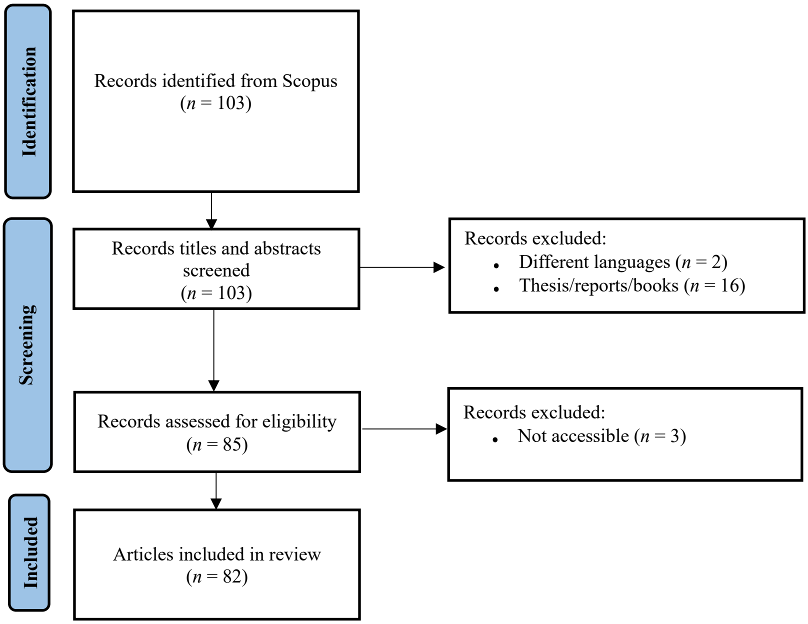

Figure 2. Refinement process based on the PRISMA guideline. Source: Authors' own work

occurrence analysis. Herein, as the quantitative analysis, several assessments were carried out to gain a clearer picture of the research progress in the RL field in the CI. Accordingly, these analyses included: (1) trends in the number of published articles; (2) distribution of articles across journals; (3) research methods used in articles and (4) country-wise analysis. As part of the co-occurrence analysis, a clustering analysis was carried out using the software VOSviewer to examine the comprehensive relationships between keywords in refined articles. This method has previously been applied to analyse research trends (Du *et al.*, 2014) and discover research hotspots (Du *et al.*, 2015), which was also the purpose of doing it in the current study.

To ensure methodological rigour, an in-depth content analysis was conducted following the bibliometric analysis to gain a deeper understanding of the evolving trends in RL research within the construction context. According to Seuring and Müller (2008), the analytical categories form the structural dimensions to develop the final themes in a content analysis, which can be derived either deductively or inductively. In this review, the bibliometric analysis, particularly the keyword co-occurrence analysis, provided a robust basis for deductively determining certain themes for the content analysis (Prajapati *et al.*, 2019), such as *"Barriers to the effective implementation of RL"*. The remaining themes, including *"Mitigation strategies to overcome identified barriers"*, were derived inductively from the reviewed literature. For theme development, the three-phase content analysis process by Williams and Moser (2019) was followed in this study. Table 1 demonstrates a part of the coding structure for the final theme, *"Barriers to the effective implementation of RL"*, as an example, since presenting the entire coding structure is not feasible. Accordingly, the analysis started with organising the representative quotes with similar underlying meanings extracted from the articles, forming preliminary themes known as open codes (analytical categories). Then, these open codes were reviewed, refined and consolidated to make axial codes (structural dimensions), as shown in Table 1. Next, these axial codes were further refined and categorised into selective codes, which are the final themes of the study. To ensure analytical

Table 1. Example of coding structure

Representative quotes from the articles	Open codes (analytical categories)	Axial codes (structural dimensions)	Selective codes
Barriers namely, insufficient government policies, (. . .. .) stimulate each other and also drive all other barriers (Ambekar et al., 2022)	Lack of legislation and policies	Government barriers	Barriers to the effective implementation of RL
The industry demand and government's environmental regulations for reverse logistics in the future will force the firms to come up with innovative IT capabilities that can manage the RL operations efficiently (Ambekar et al., 2022)			
Insufficient motivation from the government such as less incentives, more taxation and low rebates, etc (Ambekar et al., 2022)	Lack of tax or economic incentives for RLSCs		
the lack of governmental support intervenes in situations such as (. . .) the absence of supervision of the imposed laws, the absence of tax or economic incentives (loan for green alternatives) programs and, in the aspects of politics conduction, (. . ..) (Silva et al., 2021)			
the SA government should consider providing "incentives" to contractors, thereby encouraging some best RL practices (Chileshe et al., 2015)			
Barriers namely, (. . .. .) unavailability of standard codes stimulate each other and also drive all other barriers (Ambekar et al., 2022)	Absence of standards and codes for reprocessed materials and products		

Source(s): Authors' own work

rigour of the coding process, the coding and themes development were undertaken by the first author, while the second and third authors independently reviewed the coding process and the resulting themes. This review process contributed to minimising subjectivity, resolving overlaps among categories and enhancing the conceptual coherence of the final themes.

Results of the bibliometric analysis

Figure 3 presents the yearly trend of the publications on RL in the CI between 2000 and 2024.

As illustrated in Figure 3, the number of articles ranged between one to five annually from 2001 to 2014, reflecting a fluctuating pattern. However, a significant upsurge in research on RL emerged after 2014 and continued through 2016. Notably, approximately half of all publications were produced within the last five years (2020–2024). During this period, the number of publications substantially rose from two articles in 2019 to 13 in 2022, showing an increase of nearly 550%. The peak year for publications was 2022; however, there was a decline in the number of publications after 2022.

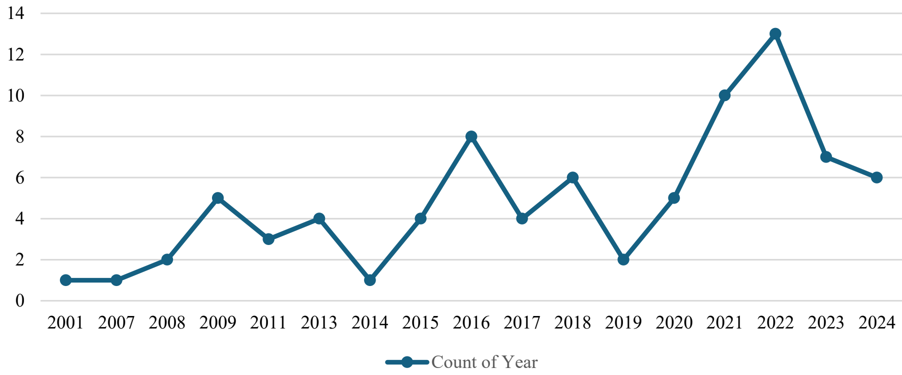

Figure 3. Annual distribution of articles throughout 2000–2024. Source: Authors' own work

Table 2 presents the top ten most significant publication sources that have substantially contributed to the advancement of the research area. A total of 37 articles were produced from these ten publication sources, collectively accounting for nearly 45% of the total articles. The journals *Sustainability* and *Waste Management & Research* lead each with seven publications, followed by *Journal of Cleaner Production* with five and *Engineering, Construction and Architecture Management* with four. This concentration of research within a few key journals underscores their central role in shaping and disseminating knowledge in this field.

Table 3 summarises the research methods used in the reviewed articles, which are categorised into mono-method and multi-method research approaches. As shown in Table 3, the majority of articles on RL in the CI ($f = 58$, 71%) used mono-method research designs and only 29% adopted multi-method research approaches. Among these, the modelling and optimisation was the most frequently applied approach ($f = 26$, 32%). This was predominantly applied as a single method, as well as in combination with other empirical methods such as case studies and surveys. In addition, studies relying solely on interviews also represent a considerable proportion of the literature in this area. Notably, the reviews and conceptual studies together contribute to 20% of all the reviewed articles, indicating a strong tendency towards conceptual development and literature synthesis in this research area.

Figure 4a and 4b illustrate the leading countries contributing to the research on RL in the CI (Figure 4a), along with their collaborative networks (Figure 4b). The analysis found that 82

Table 2. Top 10 leading sources of publications in the field

Source name	Number of articles
Sustainability (Switzerland)	7
Waste Management & Research	7
Journal of Cleaner Production	5
Engineering, Construction and Architectural Management	4
Songklanakarin Journal of Science and Technology	3
Procedia Engineering	3
Resources, Conservation and Recycling	2
International Journal of Environmental Research and Public Health	2
Waste Management	2
Journal of Construction Engineering and Management	2

Source(s): Authors' own work

Table 3. Research methods used in articles

Research methods	Number of articles	Percentage (%)
Mono-method research	*58*	*71*
- Modelling / optimisation	26	32
- Interview	8	10
- Review	8	10
- Conceptual	7	9
- Case study	4	5
- Survey	4	5
- Experiment	1	1
Multi-method research	*24*	*29*
- Case study & Modelling / optimisation	8	10
- Survey & Modelling / optimisation	5	6
- Survey & Interview	3	4
- Interview & Case study	3	4
- Review & Survey	2	2
- Interview & Modelling / optimisation	1	1
- Review & Case study	1	1
- Survey & Case study	1	1
Total articles	*82*	

Source(s): Authors' own work

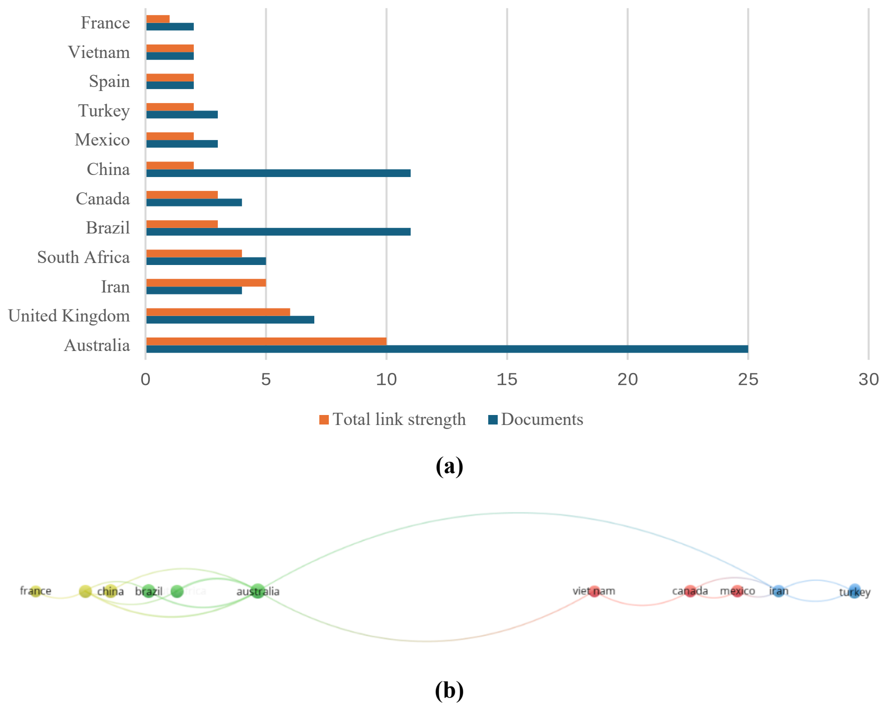

Figure 4. (a and b) Illustrations of leading countries and their collaboration nexuses in contributing to the advancement of research on RL in the CI. Source: Authors' own work

articles originated from 35 different countries. Among all, as shown in Figure 4a, Australia stands out as the highest contributor, with 25 publications focused on RL in the CI. Besides, Brazil and China also show a high level of scholarly engagement in this field, each publishing 11 articles, followed by the United Kingdom with seven publications. Collectively, these four countries account for nearly 66% of the total articles analysed.

Figure 4b shows the collaboration nexuses between countries that have published research on RL in the CI. In this figure, the size of the circle reflects the number of publications from each country, and the thickness of the connecting lines indicates the strength of international collaboration. At the national level, Australia (with 10 collaborative links) and the United Kingdom (with 6 collaborative links) demonstrate the strongest international research collaborations. In addition, Iran (with 5 collaborative links), South Africa (with 4 collaborative links), Brazil (with 3 collaborative links) and Canada (with 3 collaborative links) are also actively engaged in collaborative research efforts related to RL in the CI. Herein, the three countries, namely Iran, South Africa and Brazil, are developing countries. Despite having a relatively low number of publications, both Iran and South Africa have demonstrated a strong commitment to expanding their international research network in RL in the CI, which is an encouraging and commendable fact to highlight.

The analysis also revealed that the University of South Australia and Deakin University in Australia have emerged as leading institutions in publishing research on RL within the CI, followed by Chongqing University in China and the University of Johannesburg in South Africa. However, it is important to note that all these institutions have yet to engage in collaborative research efforts. Therefore, to advance the field, future studies should emphasise building partnerships among academic institutions in different geographical locations, which could help explore diverse dimensions of RL and improve the overall quality of research outputs.

Figure 5 illustrates the outcome of the keyword co-occurrence analysis. This analysis facilitates the creation of a network that offers valuable insights into the key topics and concepts that have been researched on the topic under study and thereby guiding the

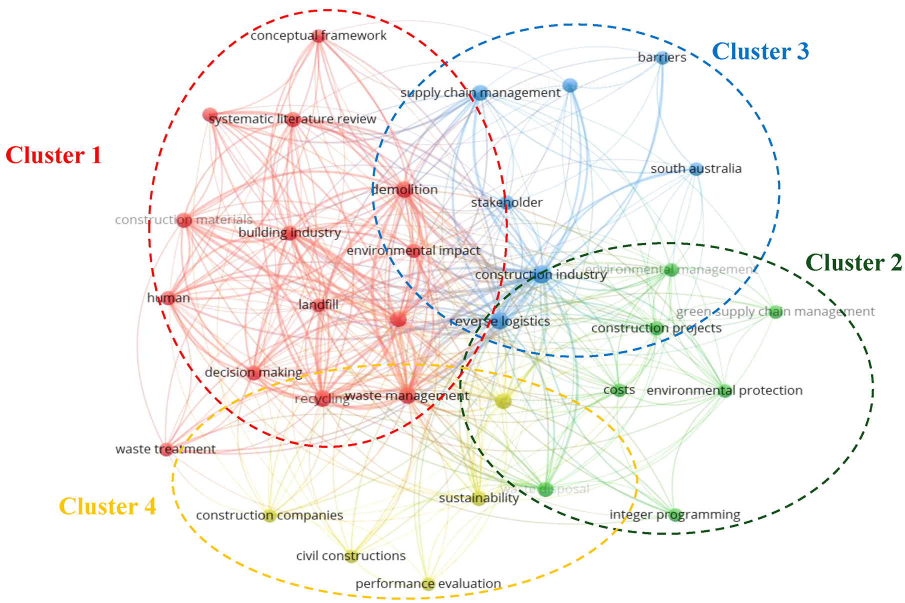

Figure 5. Illustration of keyword co-occurrence analysis. Source: Authors’ own work

researchers towards identifying the promising areas for future investigations. In this study, the VOSviewer software was used for the keyword co-occurrence analysis using a minimum threshold of four keyword occurrences. In Figure 5, the size of each circle indicates the frequency of the corresponding keyword, while the thickness of the connecting lines represents the strength of the association between keywords. Moreover, the proximity of the nodes emphasises the degree of their conceptual closeness.

As shown in Figure 5, keywords such as “construction industry” and “reverse logistics” are the most frequently appearing terms, obviously due to their inclusion in the original search string. The outcome of the keyword co-occurrence analysis exposed four main clusters of keywords associated with the field of RL in the CI, each reflecting distinct research directions with implications for practice.

Cluster 1, which is indicated in red, is the largest cluster, and the conclusions it derived could be twofold. First, the appearance of terms like “construction and demolition waste” and “demolition waste” in this cluster suggests that both waste types are encompassed within the scope of the RL in the CI. However, the seminal explanations on RL in this field emphasise that RLSCs primarily target demolition waste, which contributes to a major part of CDW (Chen *et al.*, 2021; Hosseini *et al.*, 2015). The presence of the keyword “demolition” in this cluster reinforces this perspective. Therefore, instead of broadly addressing CDW, future research should focus more specifically on demolition waste within RL in the construction context. This narrow focus on demolition waste in future research would enable better alignment of RL strategies with practical management of demolition waste, which is one of the most devastating waste categories in CDW (Chen *et al.*, 2021), making them more implementable and effective in real-world applications by overcoming existing challenges. Second, the appearance of keywords such as “decision making” and “human” and their interrelationship reflects that much of the existing research has explored the decision-making aspects within the supply chains, particularly considering human factors and stakeholder involvement.

Cluster 2, another significant group that offers further insights. The focus of this cluster shifts towards environmental management through RL, especially in efforts to reduce landfill waste via appropriate disposal methods. The appearance of keywords such as “costs” and “integer programming” and “waste disposal” and their interrelationship within this cluster and specifically with Cluster 1 indicates that a substantial body of research on this topic has adopted quantitative and optimisation-based approaches to support environmentally efficient decision-making in RLSCs. Overall, this cluster demonstrates that effective waste disposal methods and environmental outcomes are closely linked to cost consideration and optimisation-derived decision-making approaches.

Cluster 3, while it includes terms from the search string, the remaining keywords indicate a strong research focus on achieving CE and sustainable construction through overcoming barriers to implementing RL initiatives, which is of direct practical importance to the construction sector. This finding suggests that identifying and overcoming these barriers can help practitioners in the CI design more resilient and efficient RL frameworks in practice. Notably, this cluster also reflects that much of the research has been conducted in South Australia. As shown in Figure 4a, Australia leads globally in RL-related research and particularly, South Australia stands out as a research hub. Therefore, the appearance of “South Australia” as a keyword in this cluster is inevitable.

Cluster 4, which centres around “sustainability” and “sustainable development”, highlights the role of RL in achieving sustainable development goals (SDGs). The linkages between these keywords and the terms such as “construction companies” and “civil constructions” and “performance evaluation” indicate that there is a practical opportunity for the CI to rethink adopting more RL practices in demolition waste management to achieve the broader sustainability goals. This is especially relevant as the industry is always subjected to widespread criticism for being one of the least sustainable industries (Chen *et al.*, 2024). At the same time, these linkages suggest that the RL implementation in CI should not be considered as the responsibility of a single project or stakeholder group, but as a shared responsibility across different sectors within the industry.

As shown in Figure 4, there are strong relationships across four clusters, which can be explained through several interrelated keywords. For instance, the relationship between Cluster 1 and Cluster 2 indicates that the optimisation-driven stakeholder decision-making related to waste recovery directly influences environmental outcomes within RLSCs. Furthermore, the linkages of these clusters with Cluster 4 reflect that such decision-making approaches serve as a key pathway through which broader sustainability is pursued within the CI. Cluster 3, which mostly highlights the implementation barriers, shows meaningful connections with all other clusters. This indicates the importance of addressing the barriers that confront the practical implementation of RL in the CI, as these barriers directly affect the ability of RL practices to contribute to sustainability outcomes. To sum up, this keyword co-occurrence analysis demonstrates that RL research in the CI is structured around interdependent themes rather than isolated domains.

Results of the content analysis

This section presents the themes identified through an in-depth content analysis of all the extracted articles. The discussion of the results is organised into four sections: (1) Contributions of RL to achieving the SDGs; (2) Drivers for the implementation of RL; (3) Barriers to the effective implementation of RL; and (4) Mitigation strategies to overcome identified barriers.

Contributions of RL to achieving the SDGs

With the growing concerns over large raw material extraction, resource consumption, waste generation and the resulting environmental pollution, sustainable development has increasingly drawn global attention (Chen and Liao, 2022). In response, governments worldwide adopted a set of 17 priorities known as the SDGs in 2015, as a unified framework for addressing these pressing challenges (United Nations, 2017). Since the introduction of the SDGs, major industries, sectors and organisations have made significant efforts to influence the achievement of these goals (Hajian and Kashani, 2021). The CI has been strongly encouraged to align with the SDGs, given its massive consumption of natural resources and generation of large volumes of waste that typically end up in landfills. In this context, RL helps enhance resource efficiency and reduce environmental impacts, making it a crucial driver in advancing the CE and, consequently, achieving sustainable development and the SDGs (Wijewickrama *et al.*, 2022a).

Direct contributions of RL to achieving the SDGs. RL in the CI is advancing sustainable development, particularly through direct contributions to the SDGs 7 (Affordable and Clean Energy) and 12 (Responsible Consumption and Production). The RL practices, such as recovery, reuse, recycling and remanufacturing, significantly reduce the extraction of virgin materials and energy consumption, thereby advancing resource efficiency and reducing greenhouse gas emissions (Ali *et al.*, 2023; Brandão *et al.*, 2022; Chinomona and Bikissa-Macongue, 2022; Rinsatitnon *et al.*, 2018; Sobotka and Sagan, 2016). Conforming, Sobotka and Sagan (2016) highlighted that the CI can contribute to achieving SDG 12 by creating reverse supply chains for raw materials and construction products through RL. In addition to material recovery, RL also contributes to SDG 7 through the waste-to-energy (WtE) technologies, where the non-recyclable construction waste, such as treated timber and contaminated wood, is processed to produce electricity or heat (Jayasinghe *et al.*, 2019). This approach reduces waste to landfills and also contributes to cleaner energy production, particularly in environments with limited renewable energy infrastructure.

Indirect contributions of RL to achieving the SDGs. The contribution of RL to other SDGs is substantial, especially through minimising the waste that would be directed to landfills.

Previous studies emphasise that since a significant portion of construction waste arises from demolition, if demolition waste is not properly managed, it ends up in landfills (Wardani *et al.*, 2022; Wijewickrama *et al.*, 2023). An increase in landfill waste leads to many detrimental impacts on the environment, social and economic well-being. For instance, larger landfill volumes generate more leachate, which can seep into and contaminate the groundwater (Jayasinghe *et al.*, 2023). Furthermore, communities living near landfills may be subject to reduced quality of life due to unpleasant odours and increased public health risks such as respiratory problems, waterborne diseases and exposure to toxic substances (Pushpamali *et al.*, 2020). Therefore, by implementing RL practices, the waste that will be disposed of at landfills could be reduced (Correia *et al.*, 2021), thereby minimising environmental pollution, including water pollution and improving public health and well-being. With this, RL indirectly contributes to the achievement of SDG 6: Clean Water and Sanitation and SDG 3: Good Health and Well-being.

Furthermore, RLSCs play a key role in promoting sustainable and resilient urban environments. For example, Chileshe *et al.* (2016a) mentioned that through promoting RLSCs, the illegal dumping and environmental footprint of waste disposal in urban areas will be reduced, making them cleaner, healthier and more liveable. Similarly, by diverting demolition waste from landfills and subjecting them to reuse, remanufacture or recycling, RL reduces the demand for natural resource extraction, which often leads to deforestation, soil erosion and destruction of natural habitats (Chen and Liao, 2022). With this, RLSCs contribute to conserving biodiversity and preventing land degradation, thereby promoting sustainable land use. Accordingly, it is evident that the RL indirectly supports the achievement of SDG 11: Sustainable Cities and Communities and SDG 15: Life on Land.

The RLSCs create new and innovative business opportunities for organisations, promoting green jobs in recycling, materials handling and energy recovery (Chileshe *et al.*, 2016a; Pimentel *et al.*, 2022). For instance, through the adoption of RLSCs in South Australia, new jobs have been created in the CI, which are related to demolition companies, waste processing companies and reprocessed materials supplying companies (Chileshe *et al.*, 2016a). Similarly, in Portugal, RLSCs support economic growth by reducing costs from lesser usage of virgin materials, reducing transport and disposal costs and through the generation of revenue from the sale of reprocessed materials (Pimentel *et al.*, 2022). Furthermore, RL urges multi-stakeholder collaboration and mutual trust across the supply chain, among clients, contractors, demolishers, waste processors and external stakeholders such as the government and other regulatory bodies (Pushpamali *et al.*, 2021; Wijewickrama *et al.*, 2021). In addition, RLSCs promote innovation in infrastructure use within the CI, especially to improve efficiency and effectiveness of building dismantling, on-site sorting and reprocessing activities (Wijewickrama *et al.*, 2022b). Through these developments, the adoption of RL in the CI contributes to achieving SDG 8: Decent Work and Economic Growth, SDG 17: Partnerships for the Goals and SDG 9: Industry, Innovation and Infrastructure.

In conclusion, the careful review of the selected articles affirms that the adoption of RL in the CI can directly contribute to achieving SDGs 7 and 12. Additionally, RL can indirectly support the attainment of SDGs 3, 6, 8, 9, 11, 15 and 17 by enabling progress towards SDGs 7 and 12. These contributions are demonstrated in Figure 6. Therefore, RLSCs play a crucial role in steering the CI towards sustainable development. However, for the successful implementation of RL in contributing to these goals, it is crucial to identify the key drivers, barriers and corresponding mitigation actions.

Drivers for the implementation of RL

Several drivers encourage the implementation of RL in the CI. According to previous studies, these drivers have been presented under different classifications. Hammes *et al.* (2020) classified these drivers as internal forces and external forces, while Chileshe *et al.* (2016b) and Sobotka and Czaja (2015) classified RL drivers into three main categories: environmental,

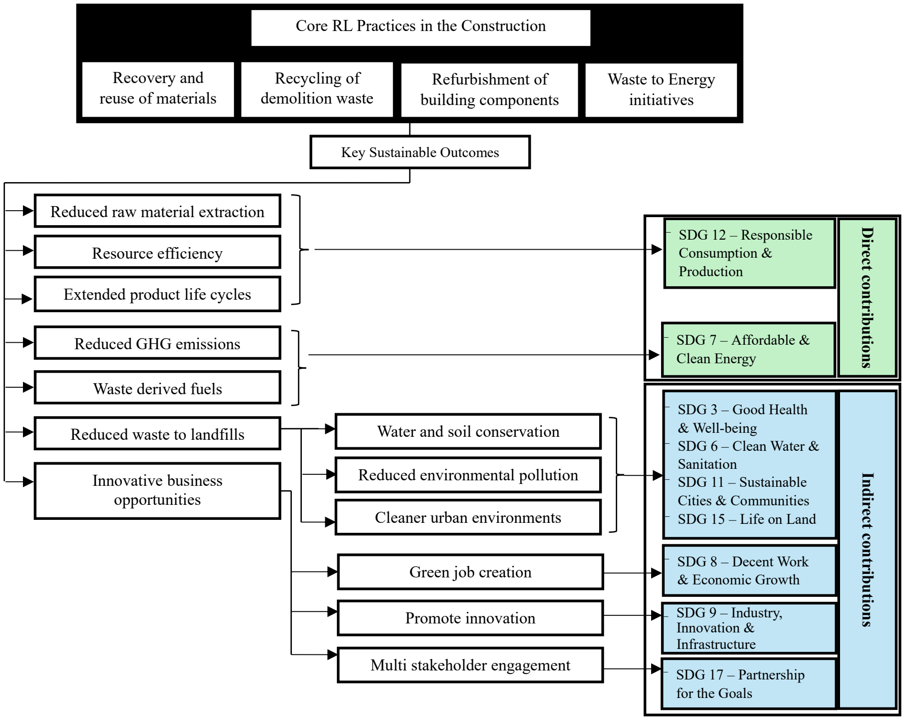

Figure 6. Contributions of R L to achieving S D Gs. Source: Authors' own work

economic and social drivers. This section provides a concise overview of the key drivers that have supported the adoption of RL, following the latter classification framework, which is considered more comprehensive.

Economic drivers. Many economic drivers were reported in extant literature to support the implementation of RL in the CI. For instance, the reduction of production costs due to the minimum usage of virgin materials (Ali *et al.*, 2023; Sobotka and Czaja, 2015), profits from the sale of recovered raw materials and construction products (Chinda, 2017; Sobotka and Czaja, 2015), lower cost of waste disposal (Chileshe *et al.*, 2016a) and reduced transportation cost (Zahedi *et al.*, 2021) are frequently mentioned. Chinda (2017) also highlighted that in the context of the Thai CI, the costs of landfilling and the penalties for breaching waste disposal regulations are additional economic drivers of RL implementation. Sobotka and Czaja (2015) stated that the RLSCs in construction can lead to the recovery of up to 85% of the total mass of the work at the end of its life, potentially reducing the life cycle building cost by 30–50%, making it an economic driver for the implementation of RL.

Environmental drivers. From the environmental perspective, several drivers have been identified in the literature that steer the implementation of RL in the CI. These include policies promoting the deconstruction and reuse of salvaged materials, meeting the environmental needs of the clients, the scarcity of natural resources and the possibility of reversing the negative environmental impacts of construction activities (Ali *et al.*, 2023; Chileshe *et al.*, 2016a; Kadaei *et al.*, 2023; Sobotka and Sagan, 2016). Additionally, the ability of RLSCs to optimise the utilisation of demolition waste by diverting it from landfills (Nguyen and Le, 2022) is also recognised as a significant environmental driver.

Social drivers. According to Chileshe *et al.* (2016a), social drivers are acknowledged as complementary to the economic and environmental drivers, although not as significant when considered in isolation. Nevertheless, several studies have recognised that social factors are important drivers for RL implementation (Chileshe *et al.*, 2018; Chinda, 2017; Sobotka and Czaja, 2015). For example, Chinda (2017) identified that improvement in an organisational "green image" is an influential driving force for adopting RL practices. Besides, corporate social responsibility, meeting community expectations, job creation and enhanced competitiveness are also recognised are notable social drivers for RL implementation in the CI.

Barriers to the effective implementation of RL

Even though RL contributes immensely towards achieving sustainable development, its implementation in the CI encounters several barriers that must be addressed. Collectively, these barriers can be classified into five main groups: governmental, infrastructure, operational, managerial and social barriers, as illustrated in Figure 7.

Governmental barriers. One of the significant barriers, as widely acknowledged by several authors, is the lack of government support, which in turn, affects various other issues, including the absence of logical, conscientious and equitable legislation, weak enforcement of existing laws and the lack of tax or economic incentives for RLSCs (Ambekar *et al.*, 2022; Silva *et al.*, 2021; Chileshe *et al.*, 2015; Delmonico *et al.*, 2018). Moreover, the lack of government support also leads to the absence of standards and codes for reprocessed materials and products, further hindering the adoption of RL in the CI.

Infrastructure barriers. Another major concern identified by researchers is the scarcity of technological and physical resources and improper management of RL infrastructure. For instance, Brandão *et al.* (2022) mentioned that the location of recycling facilities becomes a serious bottleneck for promoting RL, as many of these recycling facilities are located far from metropolitan areas. The distance between waste generation sites and recycling infrastructure is directly proportional to the transportation costs (Zahedi *et al.*, 2021), which in turn increases the price of the recycled materials (Yiping and Jongjin, 2013), discouraging their use.

Operational barriers. There are operational barriers that impede the successful adoption of RL. For example, difficulties in managing contaminated or hazardous materials are a prevalent challenge in RL operations in CI (Wijewickrama *et al.*, 2022a). In the context of the RL conceptualisation in the CI, the RLSCs start with the building dismantling (Hosseini *et al.*, 2015). Two main dismantling techniques are commonly used in the CI: deconstruction and demolition (Brandão *et al.*, 2022). Compared to demolition, deconstruction takes more time and is more costly (Brandão *et al.*, 2022) and labour-intensive, making it a less preferred option in the CI (Silva *et al.*, 2021; Pimentel *et al.*, 2022). Furthermore, existing buildings were not designed to be deconstructed, making material recovery more challenging (Correia *et al.*, 2021). As such, the most preferred option is demolition, which generates piles of mixed debris that are difficult to sort and thus, destined for landfills (Wijewickrama *et al.*, 2022a). Therefore, limited adoption of deconstruction over demolition is a significant barrier that hinders the successful implementation of RL in the CI.

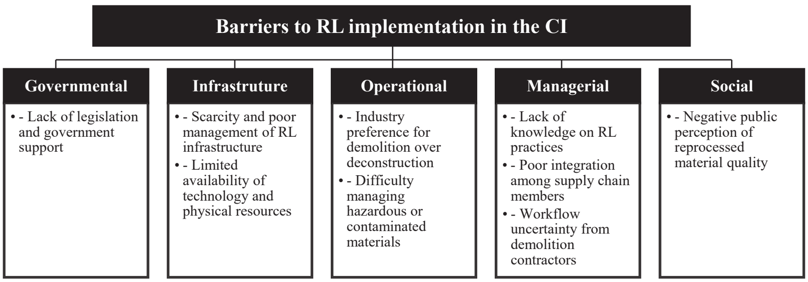

Figure 7. Barriers to the effective implementation of R L in the C I. Source: Authors' own work

Social barriers. Despite significant efforts to promote RL in the CI, the end users' negative perception about the quality of reprocessed products continues to inhibit its adoption in practice. Due to this social issue, construction practitioners are hesitant to use reprocessed products in their projects (Chileshe *et al.*, 2015). According to Pushpamali *et al.* (2021), the overall quality of reprocessed products should be at least equal to the quality of virgin products for them to be accepted for new construction. However, end-users have a negative perception that the quality of reprocessed products is less than that of virgin materials, owing to the stigma attached to the terms "recycled" or "reused" (Pushpamali *et al.*, 2021). Extending beyond this perception, industry practitioners have also experienced the inferior quality of reprocessed products compared to that of virgin materials (Chileshe *et al.*, 2015, 2016a). On this note, the inferior quality of reprocessed products is criticised globally, becoming the primary constraint restricting the popularity of reprocessed products (Wijewickrama *et al.*, 2023).

Managerial barriers. In addition to the previously mentioned barriers, many managerial-related barriers hinder the successful adoption of RL in the CI. These include limited or a lack of knowledge on RL practices, poor integration among supply chain members and workflow uncertainty associated with demolition contractors (Silva *et al.*, 2021; Correia *et al.*, 2021; Wijewickrama *et al.*, 2021).

Mitigation strategies to overcome identified barriers

To ensure the effective implementation of RL in the CI, it is essential to address the barriers that hinder its adoption. Table 4 outlines the corresponding mitigation strategies aimed at overcoming the above-identified barriers.

As shown in Table 4, each barrier was paired with targeted strategies that are most appropriate to address, with supporting citations provided for academic rigour.

Policy-level strategies. Herein, the mitigation strategies identified through the literature review highlight the need for an integrated and collaborative approach to overcoming barriers to RL implementation in the CI. Within this approach, the government and related regulatory bodies have a crucial role to play, especially through the enforcement of policy-oriented interventions. These include, as shown in Table 4, enforcing environmental regulations, providing tax reductions for companies using recycled materials, using Public–Private Partnerships (PPPs) to promote RL, imposing landfill disposal fees and penalties and developing standards and codes for reprocessed products. For example, Ambeker *et al.* (2022) highlighted that the adoption of RL practices in the CI in India is only possible through government interventions, such as the implementation of robust legislation and waste management policies.

Similarly, Chinomona and Bikissa-Macongue (2022) mentioned that regulatory pressure in South Africa has a positive influence on RL, emphasising that the greater government involvement leads to more effective RL practices. Therefore, these government-led strategies collectively serve as effective mechanisms for promoting sustainable behaviour among industry stakeholders (Brandão *et al.*, 2022; Pimentel *et al.*, 2022).

Organisational and supply chain level strategies. Organisational and supply chain transformation also play a vital role in promoting RL in the CI. This includes nurturing cross-functional collaboration, increasing top management commitment, encouraging shifts in organisational attitudes and integrating RL considerations into early project planning phases (Chileshe *et al.*, 2016a; Kadaei *et al.*, 2023). Empirical studies provide evidence for the effectiveness of these strategies. For instance, Kadaei *et al.* (2023) pointed out that collaboration between RL partners, such as contractors, suppliers and waste service providers, is one of the most significant strategies that overcome managerial-led barriers, which inhibit the adoption of RL practices in Iran. Similarly, Chileshe *et al.* (2016a), through industry-based evidence, proved that early-stage synergising of RL considerations into project planning, facilitated by top management support in construction companies, leads to measurable improvements in RL performance in South Australia. As an important finding, the previous

Table 4. Mitigation strategies to overcome barriers to RL in the CI

	Barrier	Category	Mitigation strategy	References
1	Lack of legislation and government support	Governmental	- Enforce environmental legislation, regulations and directives	Brandão *et al.* (2022), Chileshe *et al.* (2016a), Correia *et al.* (2021), Kadaei *et al.* (2023), Schamne and Nagalli (2016)
			- Provide tax reductions for companies using recycled materials	Brandão *et al.* (2022), Pimentel *et al.* (2022)
			- Use PPPs to promote the RL	Brandao *et al.* (2023)
			- Impose landfill disposal fees and penalties	Brandão *et al.* (2022)
			- Develop standards and codes for reprocessed products	Wijewickrama *et al.* (2022b)
2	Scarcity and poor management of RL infrastructure	Infrastructure	- Develop infrastructure and facilities for RL	Ambekar *et al.* (2022), Correia *et al.* (2021), Kadaei *et al.* (2023), Su *et al.* (2021)
			- Implement cooperative waste transportation systems	Chen and Liao (2022), Hammes *et al.* (2020), Schamne and Nagalli (2016), Yiping and Jongjin (2013)
3	Industry preference for demolition over deconstruction	Operational	- Provide financial incentives for deconstruction	Ambekar *et al.* (2022), Brandão *et al.* (2022), Chileshe *et al.* (2016b)
			- Require a deconstruction plan before issuing permits	Pimentel *et al.* (2022)
			- Consider RL at the planning stages of construction projects	Chileshe *et al.* (2016a)
4	Negative public perception of reprocessed material quality	Social	- Ensure quality control compliance for salvaged products	Chileshe *et al.* (2016b), Wijewickrama *et al.* (2022a, b, 2023)
			- Create measurable performance indices for RL activities	Ambekar *et al.* (2022), Correia *et al.* (2021)
5	Limited availability of technology and physical resources	Infrastructure	- Implement strong IT systems to support RL	Ambekar *et al.* (2022), Huang *et al.* (2022)
			- Increase management commitment to RL investments	Ambekar *et al.* (2022), Correia *et al.* (2021)
6	Difficulty managing hazardous or contaminated materials	Operational	- Define clear policies and processes for handling such materials	Ambekar *et al.* (2022), Chileshe *et al.* (2016b), Kadaei *et al.* (2023), Schamne and Nagalli (2016)
			- Reducing the amount of contaminated waste generation as part of strategic objectives	Chileshe *et al.* (2016b), Rabnawaz Ahmed and Zhang (2021)
7	Lack of knowledge on RL practices	Managerial	- Conduct workshops and awareness programs	Correia *et al.* (2021), Pimentel *et al.* (2022)

(*continued*)

Table 4. Continued

	Barrier	Category	Mitigation strategy	References
8	Poor integration among supply chain members	Managerial	- Promote strategic collaboration with RL partners - Encourage changes in organisational attitudes	Ali *et al.* (2023), Hammes *et al.* (2020), Kadaei *et al.* (2023) Chileshe *et al.* (2016a, 2016b)
9	Workflow uncertainty from demolition contractors	Managerial	- Implement cross-functional collaboration within organisations	Hammes *et al.* (2020), Kadaei *et al.* (2023), Wijewickrama *et al.* (2021)

Source(s): Authors' own work

studies emphasised that these organisational efforts must be carried out by mechanisms that enhance transparency and trust. This includes implementing quality control standards, performance measurement frameworks and the implementation of advanced information technology (IT) systems (Huang *et al.*, 2022; Wijewickrama *et al.*, 2022a).

Capacity-building initiatives. Finally, capacity-building through knowledge-transfer initiatives, such as awareness programs, workshops and training, serves to bridge the existing knowledge gap and foster stakeholder engagement (Correia *et al.*, 2021; Pimentel *et al.*, 2022) for the successful implementation of RL in the CI. For instance, Correia *et al.* (2021) emphasised that construction industries, regardless of the country, should develop the skills of their key personnel in RL practices. Herein, the authors specifically pointed out the importance of developing and implementing a dedicated research and development (R&D) framework for Design for Reverse Logistics (DfRL) to overcome most of the technical barriers associated with adopting RL in the CI. These findings demonstrate that practical knowledge-building initiatives raise stakeholders' awareness about the tools and competencies required for long-term RL integration. In summary, empirical support suggests that well-structured and strategically developed mitigation efforts offer a strong foundation for embedding RL practices into the CI. They not only address immediate operational and regulatory challenges but also contribute to broader sustainability goals, such as those outlined in the SDGs.

Discussion of the findings

The discussion of the SLR findings is structured into two sections. First, a discussion on descriptive analysis, followed by a discussion of content analysis.

Discussion on descriptive analysis

The analysis of the literature emphasises that there is a growing scholarly interest in RL in the CI. While studies on the topic started back in 2021, it has gained considerable momentum since 2014, continuing until 2016. A similar trend was also observed in the previous scientometric mapping of the knowledge domain of RL in a general context, irrespective of the industry, conducted by Yang and Thoo (2023). According to these authors, this increase could have resulted from the introduction of the 2030 Agenda for Sustainable Development in 2015 and the Paris Agreement in 2016. Although there was a decline in publications from 2016 to 2019, a rapid upsurge in articles occurred over the last five years, with the highest peak in 2022. This recovery supports previous studies (Lu and Zhang, 2022; Prajapati *et al.*, 2019; Sabour *et al.*, 2023; Wijewickrama *et al.*, 2021; Yang and Thoo, 2023), indicating that the unprecedented industry's awareness of environmental safeguarding in recent years has spurred the exceptional interest of researchers in this area. However, after 2022, there was a dramatic reduction in the publications, over the period from 2023 to 2024, mainly due to several reasons.

One reason is that after the COVID-19 pandemic, the research focus has mostly shifted towards areas like medical waste management and supply chain resilience (Rejeb *et al.*, 2023), temporarily diverting from RL-specific studies in contexts like construction. On the other hand, this decline could also be attributed to delays in research funding and project execution during the COVID-19 period, which in turn reduced the production of new publications (Sohrabi *et al.*, 2021).

Although most of the articles appear in journals focused on waste management, a comprehensive review of all articles reveals that they were published across more than 30 different journals. This reflects the multi-disciplinary nature of the concept of RL in the CI, a perspective also outlined by previous SLRs related to the area of study (Jayasinghe *et al.*, 2019; Lu and Zhang, 2022; Prajapati *et al.*, 2019; Sabour *et al.*, 2023; Wijewickrama *et al.*, 2021; Yang and Thoo, 2023). Furthermore, most research on RL in the CI has adopted mono-research methods, with modelling and optimisation being the most frequently used approaches. The relatively low adoption of multi-method research highlights the limited methodological triangulation in the existing RL research with the CI, which in turn raises the need for future studies to integrate analytical, empirical and qualitative methods to improve the robustness and practical relevance of the topic.

Australia is the pioneer in publishing the most articles on RL in the CI. Even though previous studies revealed that European countries are champions in embracing CE efforts through RL practices (Halog *et al.*, 2021), this study found that, in terms of scholarly contributions to RL, Australia is far ahead in comparison to European countries. Reports indicate that Australia's overall recycling rate is approximately 67%, which is higher compared to other developed countries such as the USA and Norway (Wu *et al.*, 2023), as well as most developing countries like China (Zhang and Tan, 2020) and India (Saju, 2020). Since there is an unprecedented political push to embrace the CE in Australia (Halog and Anieke, 2021), the Australian performance in RL research is conceivable. Within Australia, SA has achieved a CDW diversion rate of 91.4% (Green Industries SA, 2020), which is the highest diversion rate among all the states. Therefore, embracing RL practices already being practically implemented in Australia could be beneficial for other countries aiming to improve their waste management performance, which is also a fact highlighted by Zhao *et al.* (2022).

It was also found that the researchers in developing countries have managed to establish successful collaborations with developed countries in the field of RL in the CI. Although previous SLRs on RL in the CI (Jayasinghe *et al.*, 2019; Sabour *et al.*, 2023; Wijewickrama *et al.*, 2021; Yang and Thoo, 2023) found that developed countries are significantly contributing to promoting greener construction, the current study found that both developed and developing countries are involved in doing research in RL. However, it is noticeable that the enthusiasm for this topic in developing countries is far greater than in developed countries.

Discussion on content analysis

Drawing on previous literature findings, this subsection presents the findings in a structured manner in the form of a conceptual framework, as shown in Figure 8. According to Miles and Humberman (1994), a conceptual framework is a written or visual product that discusses the primary concepts, variables or factors to be studied, as well as the hypothesised relationships among them, in either narrative or graphic form. Correspondingly, the developed conceptual framework consolidated the drivers, barriers and mitigation actions towards implementing RL in the CI.

Figure 8 presents an integrated conceptual framework that illustrates how various elements interact to influence the implementation of RL in the CI to achieve sustainable development. As shown in the framework, drivers such as economic, environmental and social factors enhance the effectiveness of implementing RLSCs, whereas barriers, including governmental, infrastructure, operational, social and managerial barriers, tend to inhibit their success. For RL to be effectively adopted in the CI, these barriers must be addressed through targeted

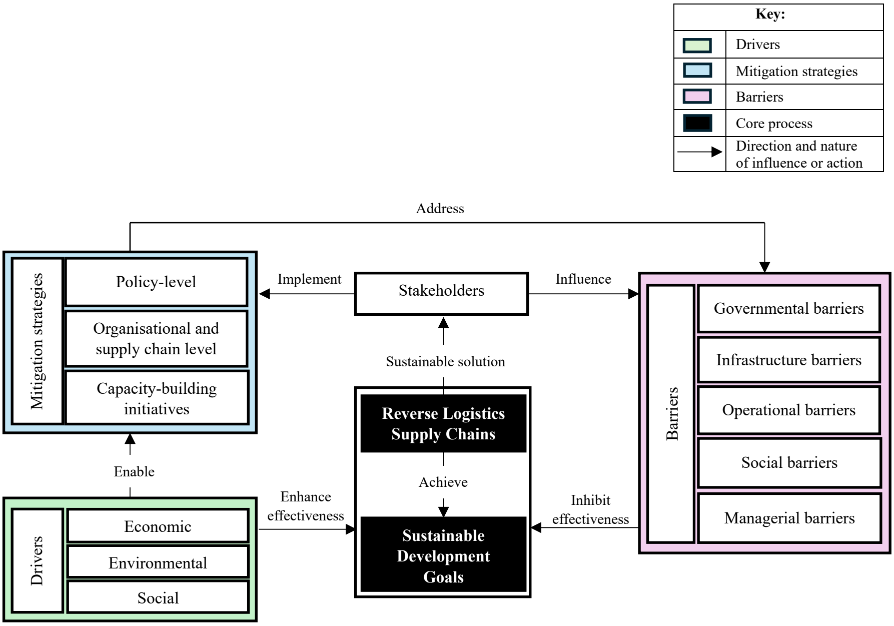

Figure 8. Conceptual framework for implementing RL in the CI to achieve sustainable development. Source: Authors' own work

mitigation strategies at the policy level, organisational and supply chain level and via capacity-building initiatives, all of which are enabled by the identified drivers. The framework also highlights the pivotal role of stakeholders, who are responsible for both implementing mitigation strategies and influencing the creation or persistence of barriers. When these barriers are successfully addressed through mitigation strategies, RL implementation becomes more effective, supporting the achievement of SDGs and providing accessible, sustainable solutions for stakeholders across the CI and broader society.

As shown in the framework, the stakeholders associated with reverse supply chains are playing pivotal roles in RL implementation, whose influence is both multidimensional and dynamic. According to Brandao *et al.* (2023), stakeholders influence RL processes through strategic decision-making and resource allocation while providing sustainable solutions that enhance system effectiveness, thereby transforming RL from a mere operational requirement to a strategic value driver. These stakeholders include both internal and external stakeholders. Among internal stakeholders, the demolition and waste processing organisations are directly involved in RL practices, making their involvement crucial for the RL implementation in the CI (Tennakoon *et al.*, 2022). External stakeholders, such as the government, play dual roles as regulators and custodians, significantly influencing the RLSCs through policies, incentives and oversight (Wijewickrama *et al.*, 2022a). The authors further mentioned that the forward supply chain, both upstream and downstream actors, influences the RLSCs differently by being the initiators and promoters, respectively. Therefore, both internal and external stakeholders act as enablers, implementers and supporters of RL systems, emphasising their centrality to sustainable development in construction.

The current study found several economic, environmental and social drivers that influence stakeholder behaviours and decision making within RLSCs in the CI. Although these classifications of drivers are similar to the sustainability dimensions, they indicate two conceptually different concepts. Herein, the sustainability dimensions and associated SDGs represent global, outcome-oriented policy objectives (Ríos *et al.*, 2025), whereas the identified drivers in this study reflect operational and strategic factors that influence organisational decision-making and motivate the implementation of RL in the CI. In simple words, the sustainability dimensions and SDGs reflect what outcomes are to be achieved, while the drivers indicate why and how organisations in the industry are motivated to adopt RL in the real context. Even if these concepts refer to two different concepts, the findings of this study indicate that there is a linkage between them whereby RL drivers act as enabling mechanisms that support progress towards achieving relevant SDGs.

As shown in Figure 8, the economic drivers include production cost reduction due to less virgin material usage (Ali *et al.*, 2023; Sobotka and Czaja, 2015), profits from recovered material sales (Chinda, 2017), lower waste disposal costs (Chileshe *et al.*, 2016a) and transportation cost reduction (Zahedi *et al.*, 2021). Environmental drivers include environmental regulations, resource scarcity and the need to minimise negative environmental impacts (Kadaei *et al.*, 2023; Sobotka and Sagan, 2016). Social drivers, while often supporting economic and environmental factors, rather than standing alone (Chileshe *et al.*, 2016a), include enhanced corporate image, social responsibility, community expectations and increased competitiveness (Ali *et al.*, 2023; Chileshe *et al.*, 2018). These drivers collectively influence the stakeholders and encourage the RL practices in the CI, which is a sustainable solution to achieve the CE and ultimately the sustainable development.

Previous studies have classified barriers to implementing RL in the CI in various ways. For instance, Correia *et al*. (2021) categorised these barriers as organisational, managerial, social, governmental, financial and infrastructural. Similarly, Pushpamali *et al*. (2021) conducted a study to identify barriers from stakeholder perspectives, grouping them into five major categories: cost, quality, time, flexibility and environmental. After carefully reviewing all the selected articles, and as illustrated in Figure 8, the study proposed the most appropriate and logical classification of barriers under five major barrier categories that limit RL effectiveness: governmental, infrastructural, operational, managerial and social. Most of these barriers are interconnected in such a way that one barrier often leads to the creation of another. Therefore, these barriers must be addressed systematically, as they collectively hinder the successful implementation of RL in the CI.

The framework further illustrates that the stakeholders have direct and indirect influence in creating these barriers and in implementing targeted mitigation strategies. A similar observation was also made by Osei *et al.* (2024) in their study on CE implementation in general, regardless of industry. This dual pathway reflects the strategic leverage stakeholders have in shaping enabling conditions for RL success. The study found several mitigation strategies that could be undertaken to address the barriers, which can mainly be categorised as policy-level interventions (e.g. enforcement of environmental regulations, deconstruction plans, disposal fees and tax relief), organisational and supply chain level interventions (e.g. cross-functional communication, strategic partnerships, attitudinal transformation and early integration of RL at the project planning phase) and capacity-building interventions (e.g. awareness programs, workshops and training). As illustrated in Figure 8, the identified drivers not only influence stakeholder priorities but also enable the development and implementation of targeted mitigation actions, thereby addressing the barriers and boosting the effective implementation of RL in the CI.

In conclusion, the effective implementation of RL in the CI is highly dependent on active stakeholder engagement. On one hand, when the stakeholders respond to key drivers and actively engage in mitigating barriers, the effectiveness of RL is significantly enhanced, contributing to a sustainable CI. On the other hand, when stakeholders fail to address the critical barriers, the effectiveness of RL can be severely jeopardised even in the presence of strong economic, environmental and social drivers. This dynamic reflects the important role of stakeholders in the RLSCs as both agents of change and potential bottlenecks, depending on their level of commitment and actions across the supply chain. Furthermore, the framework underscores that RL is a key enabler for achieving several SDGs. Specifically, the concept directly contributes to the attainment of SDGs 7 and 12, through which the additional goals, including 3, 6, 8, 9, 11, 15 and 17 can also be achieved. Therefore, RL should not be considered merely as a waste reduction tool, but as a strategic enabler of sustainability in the built environment. This emphasises the necessity for a holistic, stakeholder-derived and system-level approach in operationalising the RL in the CI.

Implications for future research

The current SLR provides valuable insights into the state-of-the-art research on RL in the CI. Through a combination of bibliometric and content analyses, several gaps have emerged, paving promising avenues for interesting future explorations, as presented in this section.

Geographical expansion and cross-contextual collaboration

The bibliometric analysis revealed that Australia is a pioneer in publishing articles in this knowledge domain. Notably, even within Australia, South Australia leads in researching RL in the CI. Since South Australia is globally recognised for implementing best practices and environmental legislative reforms to create a cleaner built environment (Pickin *et al.*, 2018), the existence of more research based on this state is perceivable. However, the existence of research that concentrates on South Australia while underrepresenting other Australian states might not provide a real picture of the concept. Furthermore, the strong representations of Australian studies, on the other hand, would introduce a potential geographical bias in the current review's findings. Therefore, this limitation highlights the pressing need to broaden the geographical scope of future research. Investigating RL practices in other regional and international contexts could reveal unique barriers, drivers and outcomes shaped by varying regulatory and market conditions. Furthermore, it was found that the research on RL in the CI shows limited collaborative efforts. Cross-country collaboration between higher education institutions in future research could provide valuable insights into RL implementation based on diverse political, economic and environmental contexts. Such collaborations would undoubtedly enhance the global understanding of RL in construction.

Need for more empirical studies in material-specific RL approaches

Even though academic research on RL in the CI is growing, there is still a paucity of empirical research. The bibliometric analysis found that the first and foremost study on the concept of RL in the CI appeared in 2001. Since then, until 2024, the number of empirical studies published on the topic exactly matching the keywords has been refined to 82 articles from the Scopus database, which is one of the primary academic databases. It was found that most of the studies on this topic are conceptual and theoretical rather than empirical. Therefore, future research should focus on expanding empirical investigations on this topic through case studies, interviews, surveys or action research within the CI. Furthermore, the existing studies often consider the RL concept of demolition waste in a generalised manner. However, the development of operational RL systems could benefit from doing more future research that focuses on material-specific RL strategies for waste streams that pose significant challenges in management. For instance, timber which is often contaminated or painted, raise issues for successful recyclability (Tennakoon *et al.*, 2023a, b); steel, although having strong recovery potential, still faces logistics barriers in disassembly and sorting (Rakshit *et al.*, 2025); and recycling solar photovoltaic cells poses practical issues due to scarce infrastructure and complex material composition (Gerold and Antrekowitsch, 2024). Even though these previous studies highlight the need to prioritise these waste types, there is limited empirical research focusing on these material-specific challenges. Therefore, by addressing these challenges through empirical inquiry, future studies could provide more actionable and industry-relevant insights to help advance the implementation of RL in the CI.

Understanding conflicting stakeholder interests in RL implementation

Although this study points out the critical roles played by both internal and external stakeholders in supporting RL implementation in the CI, the influence of conflicting stakeholder interests on RL adoption is an overlooked area in the existing literature. For example, previous studies revealed that while the regulatory bodies encourage RL practices, the contractors in the industry who always seek to maximise profit do not prioritise adopting RL practices such as deconstruction over demolition due to their extended time and cost implications (Brandão *et al.*, 2022; Tennakoon *et al.*, 2023a, b). Therefore, future research could explore how such opposing interests of different stakeholders' impact decision-making and long-term adoption of RL practices across different geographical locations. These future empirical studies, which primarily examine the stakeholder dynamics and conflict mediating mechanisms, could provide valuable insights for enhancing the effectiveness of RL initiatives in the CI.

Contribution of RL towards achieving the SDGs

The study found that RL facilitates the achievement of SDGs, including goals 3, 6, 7, 8, 9, 11, 12, 15 and 17. Among the reviewed literature, only Sobotka and Sagan (2016) explicitly mentioned that RL contributes to the achievement of SDG 12. All the other articles do not directly state that RL supports the SDGs; however, many of them indirectly affirm RL'spotential to achieve the remaining goals. While RL is often referred to as a key driver for sustainability, none of the previous empirical studies explicitly assess how RL practices contribute to achieving the SDGs. Therefore, future research should explore this area in detail, exploring the linkages between RL and SDGs more deliberately. This includes identifying which RL initiatives align with specific SDGs and developing metrics to measure the impact, which is an area not within this study's scope. Such interesting future research would help academics and industry practitioners to better express the broader value proposition of RL in the CI.

By addressing all these gaps, future research can significantly advance the theory and practice of RL in the CI. Ultimately, this will support the industry's transition to a CE and a sustainable built environment.

Implications for practice, policy and society

In addition to the research implications, this study offers many implications for practice, policy formulation and broader societal transformation towards sustainability through the successful implementation of RL.

Implications for industry practice

The proposed conceptual framework in Figure 8 provides several implications for the practical implementation of the RLSCs in the CI. It serves as the foundational step towards integrating RL across different geographic contexts by providing practical insights for industry practitioners regarding the various types of barriers that hinder the successful adoption of RL in the CI. These barriers may arise due to government-related constraints, infrastructure limitations, operational challenges, managerial gaps and societal attitudes.

To adopt RL effectively, these challenges must be addressed through targeted mitigation strategies at the policy level, organisational and supply chain level and capacity-building initiatives. For instance, when an organisation seeks to implement RL processes, the framework suggests that their efforts may be subjected to barriers reflected in the framework. If the barrier is government sourced, which is more impactful and since they are often outside the organisation's direct control, the mitigation strategies should originate from the policy level. While such strategies may be long-term and not immediately feasible, organisations can still rely on their internal capabilities to develop alternative approaches that partially overcome these barriers (Wijewickrama *et al.*, 2021). In this way, the framework provides a practical guide for identifying challenges and aligning appropriate strategies, making it adaptable to real-world contexts.

The framework emphasised that the implementation of RL practices in the CI is not a solitary effort but should be a collaborative effort of all the internal and external stakeholders related to the supply chain. Herein, the internal stakeholders, such as building demolishers and material waste processors, have a key role in facilitating RL activities. In the same vein, forward supply chain actors such as clients, developers and designers must also consider RL practices, especially during the early planning stages of a project. This includes considering how materials and components can be recovered, reused, or recycled at the EoL phase of facilities. Overall, the study, through its conceptual framework, affirms that all the actors across the construction value chain, regardless of whether they are directly or indirectly involved in RL, have a shared responsibility in enabling more sustainable and circular construction practices.

Implications for policy

This proposed framework emphasised that not only the CI-related actors but also other external stakeholders, such as policymakers and regulatory bodies, play an important role in promoting RL in the CI. These bodies can gain insights through this framework and implement strategies to overcome government-led barriers that significantly impede the successful adoption of RL in the CI. These interventions may include designing supportive regulatory frameworks, providing tax incentives and subsidies for companies investing in RL infrastructure, supporting pilot projects related to RL practices and establishing certification and quality assurance standards for reprocessed materials to enhance their widespread usage. Besides, government support is also essential to build industry capacity to adopt RL through training programs, public-private partnerships and funding research and innovation.

Implications for society

Promoting RL in the CI, one of the most environmentally devastating industries, is the overarching purpose of this study, and through this, the study provides a plethora of implications to society. As explained in this study, RL in the CI contributes both directly and indirectly to achieving many SDGs, including goals 3, 6, 7, 8, 9, 11, 12, 15 and 17. Herein, RL has the potential to support healthier living environments for broader society through reducing waste to landfills, promoting the reprocessing of materials, lowering greenhouse gas emissions and conserving natural resources. Furthermore, promoting RL practices in the CI would provide more green job opportunities, foster innovation in waste recovery and material processing, while building a culture of sustainability across communities worldwide.

Conclusions

This SLR aimed to explore the academic development, current state and the key themes of RL in the CI. This study was conducted by incorporating 82 articles retrieved from the Scopus database, published during the period 2000 and 2024 and was steered with both bibliometric and content analyses.

The bibliometric analysis found a steady growth in academic interest in RL over the past two decades. Australia, particularly South Australia, emerged as a global leader in publishing in this research domain. Most articles were published by *Sustainability (Switzerland)* and *Waste Management & Research* journals. The keyword co-occurrence analysis revealed four major thematic clusters that are interrelated to each other, including demolition waste management, sustainability, stakeholder-driven decision-making and barriers to implementation.

Through content analysis, the study found that RL contributes to the achievement of SDGs, particularly goals 7 and 12, which in turn support the attainment of additional goals, including 3, 6, 8, 9, 11, 15 and 17. Furthermore, a range of drivers was identified, spanning social, economic and environmental dimensions. The study also found several barriers to implementing RL in the CI, which were classified as governmental, infrastructure, operational, managerial and social. The paper presented a conceptual framework that consolidates these factors and proposes targeted mitigation strategies to overcome barriers, which primarily emanate from policy-level interventions, organisational and supply chain mechanisms and capacity-building initiatives. This study emphasised that the effective implementation of RL in the CI requires active stakeholder engagement, as stakeholders can both enable and hinder the implementation of RL practices. Accordingly, the study highlighted the importance of a holistic, stakeholder-driven and system-level approach in operationalising RL in the CI.

This study is not deprived of limitations. An unintended bias emerged when defining the keywords for the study. Although terms like "demolition waste management" are related to the field, they were not incorporated into the review and focused only on retrieving papers specifically on RL in the CI. In addition, only the Scopus database was considered, with robust justifications, but this remains a limitation. Furthermore, the review included journal papers and conference papers while excluding book chapters, reports and other grey literature that could have provided significant knowledge contributions. Therefore, there is an opportunity to conduct a future review by broadening the search and addressing the limitations inherent in the current study.

In summary, RL has significant potential to steer sustainability in the CI, not merely as a waste reduction approach but as a strategic enabler of driving the CE and achieving the SDGs. Strengthening stakeholder collaboration, expanding empirical inquiry and broadening contextual understanding are vital to unlocking this potential and embedding RL into the CI worldwide.

Ethics approval

Ethical approval was not required for this study.

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