Facilities

Metamorphosis through stakeholder behaviour: a validated behavioural framework for circular economy adoption in C&D waste management

Anne Dilogini Rex Ashokkumar, Gayani Karunasena, Nilupa Udawatta and Chunlu Liu
School of Architecture and Built Environment, Deakin University, Melbourne, Australia

Received 5 October 2025
Revised 4 March 2026
22 June 2026
Accepted 6 July 2026

Abstract

Purpose – Circular Economy (CE) adoption in construction and demolition (C&D) waste management is strongly influenced by stakeholder behaviour. However, these behavioural determinants have not been comprehensively examined. Therefore, this paper aims to address this gap by developing a behaviour-focused framework that supports this metamorphosis, linking CE adoption in C&D waste management with the creation of safe and sustainable environments.

Design/methodology/approach – A systematic literature review of 92 articles was conducted to identify behavioural constructs, indicators and interventions influence the adoption of CE. Based on the theory of planned behaviour (TPB) and norm activation model (NAM), these elements were integrated to develop a behaviour focused framework. The framework is validated through interviews with 12 experts in Victoria, Australia, analysed using frequency based thematic analysis. Policy triangulation was carried out by systematically comparing the validate constructs and interventions against national and Victorian policy documents.

Findings – The framework comprises seven constructs, 31 indicators and 41 interventions, including 12 indicators and 21 interventions newly validated by experts. Key behavioural drivers include cost perception, regulatory pressure, capability factors, moral commitment and long-term environmental awareness, supported by aligned policy, economic, technological and certification interventions. Policy triangulation indicates only partial alignment, suggesting stakeholder behaviour remains insufficiently embedded in current CE approaches.

Originality/value – The proposed framework identifies constructs, indicators and interventions that influence design phase behaviour, which can be used to support material choices, reduce waste generation and promote safer, more sustainable facilities.

Keywords Circular economy, Construction and demolition waste management, Behaviour, Stakeholders, Theory of planned behaviour, Norm activation model

Paper type Research paper

1. Introduction

Construction and demolition (C&D) waste accounts for 35 to 40% of global solid waste streams and contributes significantly to environmental risk, pollution, climate change and resource depletion (Tokede *et al.*, 2022). Similarly, Australia generates more than 75 Mt of

Facilities
Emerald Publishing Limited
0263-2772
DOI 10.1108/F-09-2025-0169

F

waste annually, of which C&D waste contributes the largest share, approximately 44% of the total waste generation (Blue Environment Pty Ltd, 2022). The circular economy (CE) has been widely promoted to address these challenges through resource efficiency, material recovery and lifecycle optimisation (Ellen MacArthur Foundation, 2021). According to Linder and Williander (2017), companies must adopt new business practices to become "circular": they must narrow (use less energy and material), slow (make use of products and components longer), close (make use of products, elements and material yet again) and regenerate (using renewable energy, non-toxic material, along with regenerate natural environmental systems) their energy and material circulation. However, global circularity remains low at 7.2% (Circle Economy, 2023), indicating that regulatory and technical approaches have not achieved systemic change.

Existing studies identify barriers such as limited infrastructure, high cost for recycled materials, limited recycling infrastructure, low market demand, weak regulatory enforcement, inadequate incentives, stringent acceptable standards and insufficient training influencing adoption (Antwi-Afari *et al.*, 2021; Grafström and Aasma, 2021; Dunant *et al.*, 2017; Campbell-Johnston *et al.*, 2019). Importantly, many of these barriers are closely linked to stakeholder behaviour. Cost related barriers reflect stakeholders' evaluation of benefit and risk. Perceived higher costs of recycled materials and uncertainty regarding financial returns influence attitudinal judgements towards CE adoption (Guerra and Leite, 2021). According to TPB, such cost benefit assessments directly shape attitudes and intention to adopt CE (Ajzen, 1991). Similarly, concerns regarding quality standards and compliance (Ghaffar *et al.*, 2020) represent perception-based evaluations rather than purely technical limitations. Barriers related with inadequate training, insufficient infrastructure and limited knowledge constrain stakeholders perceived ability to adopt CE (Begum *et al.*, 2009; Adams *et al.*, 2017). These constraints align with perceived behavioural control, which is influenced by access to resources, institutional support and skills (Ajzen, 1991). Regulatory uncertainty and weak policy enforcement further affect normative expectations within supply chains, shaping subjective norms (Dunant *et al.*, 2017).

Although the above discussion demonstrates that CE barriers are fundamentally behavioural, existing C&D research has not comprehensively addressed these behavioural dimensions. Several studies analyse economic feasibility, regulatory barriers and material acceptance (Park *et al.*, 2020; Shooshtarian *et al.*, 2022), while others apply selected TPB constructs to explain intention (Adabre *et al.*, 2023). However, these investigations often focus on rational determinants such as cost and perceived control, with limited integration of moral dimensions such as responsibility and awareness of consequences, central to the NAM (De Groot and Steg, 2009). As a result, behavioural drivers are examined separately rather than within a balanced and integrated framework. Furthermore, while interventions including financial incentives, regulatory reforms, infrastructure investment and training programs are widely proposed (Charef *et al.*, 2021; Urbinati *et al.*, 2023), they are generally presented as technical or policy solutions. The explicit linkage between these interventions and the behavioural determinants they are intended to influence is rarely articulated. This limits both theoretical clarity and practical targeting. In addition, prior research gives limited attention to early design-stage decisions and often addresses CE strategies selectively. While these broader considerations remain important, the present study specifically focuses on developing a behaviourally grounded framework that integrates rational and moral determinants and systematically links them to targeted interventions. The next section explains the theoretical underpinning of the framework.

2. Literature review – theoretical underpinning of the framework

As discussed in the previous section, the barriers identified in C&D waste management are closely associated with stakeholder behaviour. However, behavioural determinants have not been comprehensively examined in the C&D waste management context. Most studies emphasise economic, technical or regulatory constraints, while the combined influence of rational evaluations and moral responsibility remains underexplored. Sustainable decision-making is shaped by both rational considerations and moral obligations (Ding *et al.*, 2023; Li and Wu, 2019). In construction settings, stakeholders respond to economic incentives, operational efficiency and regulatory pressures (Tam and Tam, 2009; Ghisellini *et al.*, 2018). On a similar note, in facilities management contexts, asset management practices and lifecycle costing shape how professionals evaluate CE adoption. When long term asset performance is considered instead of upfront project costs, CE becomes financially justifiable and hence influences attitudinal evaluation and perceived feasibility (Elmualim *et al.*, 2012). Moreover, FM practitioners involve in asset management throughout the lifecycle are more aware of the long-term environmental impacts of decisions made during the design phase, thereby enhancing both the awareness of consequences and the moral responsibility for action (Kaewunruen *et al.*, 2024). Yet environmental responsibility and ethical values also influence pro-environmental behaviour (Schwartz, 1977). Therefore, understanding CE adoption in C&D waste management requires integrating both rational and moral determinants. To establish a theoretical basis for examining these behavioural influences, the following section reviews relevant behavioural theories and justifies the behavioural framework illustrated in Figure 1.

2.1 Behavioural theories in circular economy

There are multiple behavioural theories traditionally used in pro-environmental research such as the theory of self-regulation (TSR), theory of reasoned action (TRA), theory of planned behaviour (TPB), value belief norm (VBN), social cognitive theory (SCT), attitude behaviour context (ABC) theory, motivation opportunities abilities (MOA) model and norm activation model (NAM). While TRA and VBN emphasise attitudes and values but do not sufficiently address perceived behavioural control or feasibility constraints (Ajzen and Fishbein, 2004; Stern *et al.*, 1999). Stern *et al.* (1999) offer insights into self-efficacy and behavioural reinforcement (Bandura, 1977) yet lacks depth in internalised moral obligations. The TPB explains intention through attitudes (A), subjective norms (SN) and perceived behavioural control (PBC) (Ajzen, 1991), making it suitable for analysing cost perceptions, capability constraints, regulatory influence identified in C&D studies. However, TPB primarily captures deliberative decision making and may underrepresent moral responsibility. The NAM complements this by explaining behaviour through personal norms (PN), awareness of consequences (AC), ascribed responsibility (AR) (Schwartz, 1977; De Groot and Steg, 2009), but does not explicitly address feasibility or economic considerations. Given that CE adoption in C&D waste management involves both economic reasoning and moral accountability, neither TPB nor NAM alone is sufficient. Integrating both frameworks enhances explanatory power in environmental behaviour research (Bamberg and Möser, 2007). Although a prior study by Ding *et al.* (2023) have combined these theories, their application remains context specific. The indicators used to measure the behavioural constructs vary across sectors and decision environments. Behaviour is shaped by contextual factors (Constantino *et al.*, 2021); therefore, indicators are required to reflect industry-specific conditions. In the C&D sector, behavioural studies are limited and often focus on single CE principles, particularly recycling. A context-specific assessment of stakeholder behaviour for CE adoption at the design phase is therefore lacking. Therefore, the proposed

F

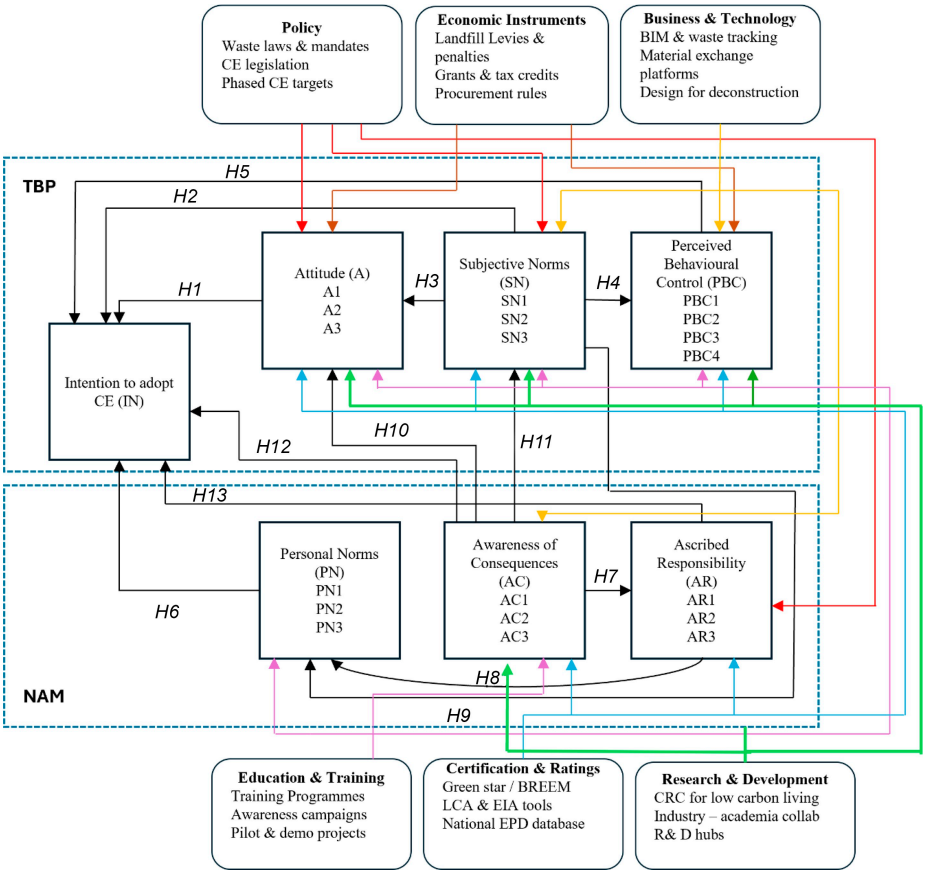

Figure 1. Theoretical framework to change the behaviour of stakeholders to adopt CE for CDWM

Note(s): A1: Perceived cost, A2: Perceived environmental benefits, A3: Policy objectives, SN1: Pressure from peers, SN2: Pressure from the government, SN3: Pressure from the public, PBC1: Skills and training, PBC2: Financial incentives, PBC3: Accessibility of infrastructure, PBC4: Regulations, IN1: Very strong intention, IN2: Strong intention, IN3: Moderate intention, IN4: Weak intention, IN5: Very weak intention, PN1: Personal sustainability and commitment, PN2: Balance between short term and long term consideration, PN3: Environmental perception, AC1: Knowledge of the environmental benefits, AC2: Economic advantages, AC3: Awareness of social implications, AR1: clarity of mandates and guidelines, AR2: Consideration of social impacts, AR3: Understanding of resource depletion, *H1*: Attitude towards adopting CE has a substantial positive impact on the intention to adopt CE. *H2*: Subjective norms have a substantial positive impact on the intention to adopt CEs. *H3*: Subjective norms have a substantial positive impact on attitudes towards CE adoption. *H4*: Subjective norms have a substantial positive impact on perceived behavioural control. *H5*: Perceived behavioural control has a substantial positive impact on the intention to adopt CE. *H6*: Personal norms have a substantial positive impact on the intention to adopt CE. *H7*: Awareness of consequences has a substantial positive impact on ascribed responsibility. *H8*: Ascribed responsibility has a substantial positive impact on personal norms. *H9*: Subjective norms have a substantial positive impact on personal norms. *H10*: Awareness of consequences has a substantial positive impact on the attitude towards CE adoption. *H11*: Awareness of consequences has a substantial positive impact on subjective norms. *H12*: Awareness of consequences has a substantial positive impact on the intention to adopt CE. *H13*: Ascribed Responsibility has a substantial positive impact on the intention to adopt CE

Source: Authors: Adopted from Ajzen (1991) and Schwartz (1977)

theoretical framework adopts a hybrid TPB-NAM approach to systematically examine rational and moral determinants of stakeholders' behaviour in CE adoption (Bamberg and Möser, 2007; Ding *et al.*, 2023). This approach uses seven key constructs as mentioned above to measure behavioural intentions. These constructs were assessed through 25 indicators as shown in Figure 1. These indicators form the empirical backbone of 13 hypotheses, five rooted in TPB, two in NAM and six integrating both as outlined in the following figure to assess the behaviour of stakeholders to adopt CE in C&D waste management. The next section outlines the methodology.

3. Methodology

This study adopts a qualitative approach incorporating a systematic literature review (SLR), semi-structured expert interviews and policy triangulation to explore stakeholder behaviour and CE adoption in C&D Waste Management.

The purpose of the SLR is to develop a theoretical framework to change the behaviour of stakeholders to adopt CE for C&D waste management. The search strategy included Scopus, Web of Science and Google Scholar, focusing on peer-reviewed, English-language studies published in the last ten years related to stakeholder behaviour, CE and C&D waste. Keywords used for the literature search include TITLE-ABS-KEY[("circular economy" OR circularity OR "closed-loop" OR "resource efficiency") AND ("construction and demolition waste" OR "construction waste" OR "demolition waste" OR CDW OR "C&D waste") AND (stakeholder* OR actor* OR decision-maker* OR client* OR contractor* OR designer* OR architect* OR engineer*) AND (behaviour OR behaviour OR "behavioural intention" OR "behaviour change" OR adoption OR implementation OR "decision making")]. After the identification of records, explicit inclusion and exclusion criteria are applied to make sure only the studies directly relevant to the objectives of the research is retained. Studies were included if they addressed CE concepts within the context of C&D waste management and examined the role, decision making or behaviour of stakeholders involved in construction projects including clients, designers, developers, contractors or policy makers. Furthermore, considered the studies with behavioural aspects related to the implementation or adoption of CE practices. Only peer reviewed journal articles and review papers published in English in the last decade are included as significant advancements and policy developments in CE and C&D waste management are seen during this time frame, making recent studies more pertinent to the current research context (Geissdoerfer *et al.*, 2017). The studies focused on CE or waste management in other sectors except C&D is excluded. In addition, non-English publications and studies without full text access is also excluded. From an initial 861 records, 92 studies were selected after applying inclusion and exclusion criteria.

Firstly, barriers to CE adoption in C&D waste management were identified and categorised into project-related and stakeholder-related barriers. Secondly, stakeholder-related barriers were further examined to identify underlying behavioural determinants. These behavioural barriers were translated into measurable indicators aligned with established constructs from TPB and NAM. Thirdly, hypotheses were derived from prior theoretical and empirical studies linking these constructs to behavioural intention. In parallel, interventions reported in the literature were identified and mapped to the corresponding behavioural constructs they aim to influence. Based on this structured process, a theory-grounded behavioural model was developed, which is presented in Figure 1.

To validate the framework, semi-structured interviews were conducted with 12 experts from Victoria, Australia, including 8 from industry, 2 from policy and 2 with combined academic and industry experience. Semi-structured interviews were chosen for their balance between structure and flexibility to explore emerging insights (Kallio *et al.*, 2016). Victoria

F

was selected as the study location due to its progressive CE policy, Department of Environment, Land, Water and Planning (DELWP) (2020) and its significant contribution to Australia's C&D waste. Purposive sampling ensured participants had relevant expertise (Tongco, 2007). Because the study was considered the design and project planning phase of CE adoption, the participants were selected by their knowledge of sustainability, waste management, CE and project decision making. Several experts also had responsibilities related to lifecycle performance, building sustainability, resource efficiency and long-term asset outcomes, providing perspectives closely aligned with FM objectives. Interviews lasted approximately 45–60 min each. All interviews were recorded and transcribed *verbatim*. A theory-driven coding approach was adopted, where barriers and TPB-NAM constructs guided initial coding, followed by refinement through iterative comparison. Codes were validated through repeated review and alignment with theoretical constructs, and only themes supported by clear expert agreement were retained. The contact details were obtained via LinkedIn and company websites. Data collection concluded upon saturation, with no new themes emerging. Ethical approval for the interviews was obtained from the Deakin University Human Ethics Committee (Ref: 2024/HE000112). Expert profiles are summarised in Table 1.

The study participants, each with 10–30 years of experience in CE and/or C&D Waste Management, brought substantial expertise to validate the proposed indicators. The findings of the semi structured interviews are analysed through a systematic manual coding and frequency analysis method. An initial coding framework is developed with the behavioural constructs, indicators and interventions identified from the literature. Manual coding was then undertaken by reviewing each transcript systematically and assigning codes to suitable segments of text related to constructs, indicators and interventions. Following coding, a manual frequency analysis is conducted by recording the number of interviews in which each construct, indicator and interventions was mentioned. The purpose of this frequency analysis was to assess the recurrence and consistency of expert perspectives and validating the literature derived theoretical framework and identifying any additional context specific elements. Frequency counts are used to indicate patterns of experts' agreement rather than to use weighting or statistical importance of individual factors in accordance with qualitative research guidance.

In addition, a policy triangulation was conducted to assess the alignment between behavioural constructs and interventions identified from literature review and expert interviews and existing policy mechanisms. Key national and Victorian policy documents policy documents such as Department of Environment, Land, Water and Planning (DELWP) (2020), *Statewide Waste and Resource Recovery Infrastructure Plan (SWRRIP)* (2018) by Sustainability Victoria (2018), National Waste Policy (2018) and *General Environmental Duty* from the Environment Protection Act (Vic.), 2017 *were systematically reviewed.* The identified constructs, indicators and interventions were mapped against policy objectives, instruments and implementation measures to assess the extent to which behavioural dimensions were explicitly addressed, partially supported or absent in current policy frameworks. The following section presents the findings from both expert interviews and policy analysis.

4. Findings and discussion

4.1 Theoretical framework to assess the behaviour of stakeholders to adopt circular economy in in construction and demolition waste management

Based on the above theoretical discussion, the following section presents the framework developed for this study.

Table 1. Profile of experts

Category	Expertise in the field and the code	Experience (years)
Industry	Senior specialist in sustainable design (E01)	>15
	Non-executive Director and Company Secretary for a private company, advocate for the adoption of prefabrication to drive faster timelines, reduced waste and increased affordability in construction. Serve as an International Advisory Committee Member, guiding strategies to advance global sustainable urban development (E02)	>25
	Diverse background spanning development, sustainability and circular economy, he offers a well-rounded perspective on urban planning (E03)	10
	Civil engineer specialised in built environment sustainability, focusing mainly on circular economy, life cycle assessment and design-out construction and demolition waste opportunities (E04)	10
	Principal at material outcomes providing consultancy specialising in the delivery of practical ESG solutions with a focus on materials and green buildings (E05)	20
	Circular economy specialist drives circular innovation in projects, methodologies and organisational capabilities through systems-based analysis, networked governance and circular design and business models (E06)	10
	CE pioneer and head of circular economy who designs, manages and continuously improves the circular economy and product stewardship program (E07)	>30
	Project leader from the modern methods of construction (MMC) industry, leading modular initiatives, delivering modular projects across the regions	>26
	Environmental sustainability lead with extensive experience in project management, NABERS and CBD assessments, energy auditing and sustainability policy and planning (E08)	10
	Senior designer, team leader and sustainability consultant	10
Policy	Policy designer and strategic leader with expertise in CE, recycling and waste (E10)	>25
	Senior advisor (environment) for a government organisation and a public sector specialist (sustainability) (E11)	18
Academia	Senior specialist in sustainability and a lecturer (E01)	>15
	Non-executive Director and Company Secretary for a private company, advocate for the adoption of prefabrication to drive faster timelines and a lecturer (E02)	>25

4.1.1 Constructs and indicators. The theoretical framework is underpinned by seven behavioural constructs, each operationalised through specific indicators to capture the factors influencing stakeholder behaviour in CE adoption and discussed below.

4.1.2 Attitude. Attitude is an individual's favourable or unfavourable assessment of engaging in a particular behaviour (Ajzen, 1991). The indicator *perceived cost* (A1) was derived reflecting the barrier of stakeholders' concerns about the financial implications of adopting CE practices, which often leads to resistance (Van Langen *et al.*, 2021; Torres Curado *et al.*, 2024). The barrier of limited awareness or appreciation for the environmental benefits of CE practices led to the development of the indicator *perceived environmental benefits* (A2), underscoring the need to understand the positive ecological impacts of CE adoption (Van Langen *et al.*, 2021; Munaro and Tavares, 2023). Similarly, the lack of coherent policies supporting CE and the presence of regulations that inadvertently favour linear models informed the indicator *policy objectives* (A3), highlighting the critical influence of regulatory frameworks on stakeholders' attitudes towards CE implementation (Mubarik *et al.*, 2024; AlJaber *et al.*, 2025). Given these barriers, stakeholders may be reluctant to adopt CE in C&D Waste Management. This leads to the first hypothesis:

H1. Attitude towards adopting CE has a substantial positive impact on the intention to adopt CE.

4.1.3 Subjective norms. The social influences that individuals experience from others who hold significance for them when they are making decisions about their behaviour is defined as the subjective norms (Ajzen, 1991). Several barriers related to social norms informed the development of key indicators influencing CE adoption. Resistance from peers towards new waste management practices led to the identification of the indicator *peer influence* (SN1), highlighting the significant impact of social resistance within the industry (Takacs *et al.*, 2022; Sajid *et al.*, 2024). Similarly, the lack of support from influential individuals or organisations, along with the absence of accreditation for secondary materials, gave rise to the indicator *pressure from the government* (SN2) (Ranta *et al.*, 2018; Mahpour, 2018). In addition, negative public perceptions of construction waste as a nuisance or environmental threat informed the indicator *pressure from the public* (SN3), reflecting how societal attitudes can discourage the adoption of sustainable practices (Torres Curado *et al.*, 2024). Accordingly, the following hypotheses are proposed:

H2. Subjective norms have a substantial positive impact on the intention to adopt CEs.

H3. Subjective norms have a substantial positive impact on attitudes towards CE adoption.

H4. Subjective norms have a substantial positive impact on perceived behavioural control.

4.1.4 Perceived behavioural control. The perceived behavioural control is the perceived difficulty or ease of carrying out the behaviour. Several key barriers informed the development of indicators related to perceived behavioural control in CE adoption. The *skills and training* (PBC1) indicator was derived from the barrier of lacking skilled employees (Lee, 2023; Munaro and Tavares, 2023). The *financial incentives* (PBC2) indicator emerged from the absence of economic or regulatory drivers for waste reduction and recycling, which can lead stakeholders to prioritise cheaper disposal options over sustainable practices (Debnath and Sarkar, 2023). Inadequate infrastructure for sorting, recycling and disposal informed the *accessibility of infrastructure* (PBC3) indicator (Ramos *et al.*, 2023; Zhao,

2021). Finally, the barrier of inconsistent or weak regulatory enforcement led to the *regulations* (PBC4) (AlJaber *et al.*, 2025). Accordingly, the following hypothesis is proposed:

H5. Perceived behavioural control has a substantial positive impact on the intention to adopt CE.

4.1.5 Intention to adopt circular economy. A measure of the effort that an individual is prepared to exert to perform the behaviour is defined as the behavioural intention (Ajzen, 1991). Intentions are assumed to capture the motivational factors that influence behaviour; they are indications of how hard people are willing to try, of how much of an effort they are planning to exert, to perform the behaviour. Generally, the stronger the intention to engage in a behaviour, the more likely should be its performance (Ajzen, 1991, p. 181).

4.1.6 Personal norms. Personal norms are the moral responsibility to carry out or refrain from activities, which is the prerequisite to behavioural intention (Schwartz, 1977). The indicator *personal sustainability commitment* (PN1) was derived from the barrier of lacking personal commitment to environmental responsibility (Takacs *et al.*, 2022). The barrier of prioritising short-term gains over long-term environmental benefits led to the indicator *balance between short- and long-term considerations* (PN2) (Bertolotti and Roman, 2024; Haessler, 2020). Finally, *environmental perception* (PN3) emerged from poor environmental beliefs and awareness, emphasising how stakeholders' environmental understanding shapes their moral norms and influences sustainable decision-making (Van Langen *et al.*, 2021). This leads to the hypothesis:

H6. Personal norms have a substantial positive impact on the intention to adopt CE.

4.1.7 Awareness of consequences. Awareness of the negative impacts on others or valued aspects when failing to act pro-socially is defined as the awareness of consequences. Three key barriers informed the development of indicators under the awareness of consequences construct, which reflects stakeholders' understanding of the broader impacts of their actions. The indicator *knowledge of environmental benefits* (AC1) was derived from the barrier of limited CE knowledge among political decision-makers (Van Langen *et al.*, 2021; Kirchherr *et al.*, 2017). The barrier of insufficient understanding of CE's environmental and economic advantages led to the indicator of *economic advantages* (AC2) (Nujen *et al.*, 2023). Finally, the indicator *social implications* (AC3) emerged from the barrier of limited understanding of CE's societal benefits, underlining the need to acknowledge outcomes such as improved community well-being and long-term resource sustainability (Valencia *et al.*, 2023; Chakraborty *et al.*, 2024). This leads to the hypothesis:

H7. Awareness of consequences has a substantial positive impact on ascribed responsibility.

4.1.8 Ascribed responsibility. A sense of accountability for the adverse effects resulting from not engaging in pro-social behaviour is defined as ascribed responsibility. Several barriers contributed to the development of indicators under awareness of responsibility, which relates to recognising the broader consequences of one's actions in the context of CE adoption. The indicator *knowledge of environmental benefits* (AR1) was derived from the barrier of limited CE knowledge among political decision-makers (Van Langen *et al.*, 2021; Kirchherr *et al.*, 2017). Similarly, the indicator *economic advantages* (AR2) emerged from the barrier of inadequate understanding of CE's environmental and financial benefits (Nujen *et al.*, 2023). Finally, the barrier concerning limited awareness of CE's societal value led to

the indicator *social implications* (AR3), reflecting the need to acknowledge impacts on community well-being and long-term resource sustainability (Valencia *et al.*, 2023; Chakraborty *et al.*, 2024). Accordingly:

H8. Ascribed responsibility has a substantial positive impact on personal norms.

The remaining hypotheses integrate constructs from both the TPB and the NAM to explore the interplay between rational and moral determinants of behaviour:

H9. Subjective norms have a substantial positive impact on personal norms.

H10. Awareness of consequences has a substantial positive impact on the attitude towards CE adoption.

H11. Awareness of consequences has a substantial positive impact on subjective norms.

4.1.9 Interventions. The second component of the framework focuses on interventions, which represent the practical mechanisms through which behavioural change can be achieved. As per the previous work by Anne Dilogini *et al.* (2025), interventions are categorised into policy and regulatory measures, stakeholder engagement and education, economic incentives and market development, technological advancements and innovation and design and construction practices. A detailed explanation of how these interventions are linked with the behavioural constructs is discussed below.

Interventions aimed at improving stakeholder attitudes towards CE in C&D Waste Management focus on increasing awareness of its economic and environmental benefits. Educational programs, training sessions and on-site campaigns enhance understanding, while pilot projects and demonstration initiatives provide practical evidence of CE success (Ramos *et al.*, 2023; Adams *et al.*, 2017). Supportive policies and procurement standards further legitimise circular practices. To influence subjective norms, interventions establish positive social expectations. Awareness campaigns, recognition programs and leadership endorsement help normalise CE behaviours across the industry (Huang *et al.*, 2023; Adams *et al.*, 2017). Peer influence in project environments and regulatory requirements such as mandated recycling targets, create normative pressure that encourages broader adoption (Ramos *et al.*, 2023). Enhancing perceived behavioural control involves providing necessary infrastructure (e.g. recycling centres, BIM tools) and simplifying processes (e.g. permitting for secondary materials). Training and clear guidelines build stakeholder confidence to engage in CE practices (Huang *et al.*, 2023; Ramos *et al.*, 2023; Adams *et al.*, 2017). To strengthen personal norms, interventions focus on moral responsibility. Educational campaigns with value-based framing, like protecting future generations, promote internalisation of environmental values (Kaluarachchi *et al.*, 2021; Zuo *et al.*, 2017). Ethical leadership, sustainability charters and stakeholder empowerment foster a culture of individual responsibility (Adams *et al.*, 2017; Ramos *et al.*, 2023).

Raising awareness of consequences is supported by visual tools (posters, videos, site demos), training and real-life experiences (e.g. landfill visits), which help stakeholders connect their actions to broader environmental and societal impacts (Kaluarachchi *et al.*, 2021; Zuo *et al.*, 2017; Huang *et al.*, 2023). Promoting ascribed responsibility involves assigning clear waste roles (e.g. site waste champions) and reinforcing accountability through policies and toolbox talks (Ramos *et al.*, 2023; Zuo *et al.*, 2017). Involving stakeholders in planning and using moral messaging strategies, such as environmental pledges, also builds a stronger sense of ownership (Adams *et al.*, 2017; Kaluarachchi *et al.*, 2021).

4.2 Validation of the framework through expert insights and policy triangulation

Validation was undertaken through expert interviews and policy triangulation to ensure theoretical rigour and contextual relevance, with details outlined in the subsections below.

4.2.1 Validation of constructs and indicators and policy alignment. All 12 experts unanimously confirmed the relevance of the seven behavioural constructs for assessing stakeholder behaviour in CE adoption in C&D Waste Management. In total, 31 indicators were validated, including 19 from the literature and 12 new indicators identified through expert insights (Table 2).

Under Attitude, experts reinforced existing indicators such as perceived cost, policy objectives and environmental benefits. Experts further highlighted education and technical literacy (new) as critical indicators, noting that "a lot of people still don't even know what circular economy means in practice" (E2). Procurement and contracting models(new) were also highlighted as influential, particularly when CE requirements are not embedded into project documentation (E3). While Department of Environment, Land, Water and Planning (DELWP) (2020) promotes CE as economically beneficial and the Sustainability Victoria (2016) addresses general awareness, but procurement models are not specifically discussed.

For SN literature-based indicators such as peer, government and public influence, were validated. Expert insights extended this construct by introducing leadership or hierarchical influence (new), company vision (new) and shareholder pressure (new) as significant indicators (E3, E4, E9). Although diversion targets in *Recycling Victoria* may indirectly affect norms, there is no explicit mention of social or internal organisational norms, making this area weakly supported in policy.

Within perceived behavioural control, indicators identified in literature such as regulations, financial incentives, training and infrastructure were validated. Experts further proposed the digital tools and platforms (new) as key enablers of behavioural control, especially for tracking waste and ensuring transparency (E6). While funding and infrastructure are supported through *Recycling Victoria* and *SWRRIP* (2018), digital literacy or technological readiness are not explicitly recognised as behavioural enablers.

Under Personal Norms, experts reinforced environmental commitment and introduced social motivation (new) and moral responsibility to future generations [new as additional drivers (E5)]. Although campaigns in the *Victorian Waste Education Strategy* attempt to foster responsibility, there is little attention to deep-rooted normative or moral drivers in current policies.

Awareness of Consequences, traditionally linked to environmental and economic awareness, was expanded by experts to include emotional responses such as climate anxiety (new), existential threat (new) and consequences of inaction (new) (E6). These emotional dimensions, though powerful motivators, are not reflected in any of the key policies analysed.

For Ascribed Responsibility, experts validated clarity of roles and regulatory accountability and extended the construct through local impact awareness (new) and the emotional burden of contributing to environmental harm (new) (E10). While legal responsibility is addressed through the Victoria (2017), but emotional and localised elements of responsibility are absent in existing policy frameworks.

4.2.2 Validation of interventions and policy alignment. Experts validated the intervention types identified in the literature and proposed *21 new interventions*, bringing the total to *41 interventions* across six categories (Table 3).

Under Policies and Regulatory Support, experts proposed construction-specific CE policies (new), phased mandates with clear short- and long-term targets (new) and planning incentives (new). While Department of Environment, Land, Water and Planning (DELWP)

Table 2. Additional indicators proposed by experts

Constructs	Indicators and code	Definition of indicators
Theory of planned behaviour		
Attitude (A)	Education/knowledge (A4)	Stakeholders' awareness, understanding and technical literacy around CE principles, practices and outcomes
	Contract and procurement models (A5)	Structure, terms and specifications incorporated into contractual agreements and procurement procedures that affect the adoption of CE practices
Subjective norms (SN)	Hierarchical influence (SN4)	Explains how supervisors or organisational leaders directly influence the norms and behaviours of their workforce, particularly in hierarchical industries like construction
	Company vision/ internal culture (SN5)	The degree to which a company's purpose or sustainability values influence individual decision-making
	Shareholder and reputational pressure (SN6)	The external pressure from investors that influences organisations to adopt sustainable practices
Perceived behavioural control (PBC)	Digital platforms (PBC5)	Presence of digital systems that enable transparency, traceability and operational ease in CE implementation
Norm activation model		
Personal norms (PN)	Social motivation and values (PN4)	Individual's sense of responsibility or drive that arises from broader societal concerns rather than purely environmental or economic incentives
	Morality (PN5)	An internal ethical framework that guides decisions about what is right or wrong
Awareness of consequences (AC)	Existential threat (AC4)	Emotional reactions to environmental crises, such as fear of collapse or worry for future generations, are what motivate awareness
	Consequences of inaction (AC5)	Understanding not just the benefits of CE but also the risks of continuing with business-as-usual practices
Ascribed responsibility (AR)	Local impact awareness (AR4)	Feeling responsible when the consequences of their actions are tied to their immediate environment
	Future harm and fear, and shame (AR5)	Emotional states that can trigger or strengthen One's sense of moral obligation to act sustainably

Table 3. Additional interventions proposed by experts

Intervention category	Specific interventions	Explanation
Policies and regulatory support	Construction-specific CE policies	Policies tailored directly to construction and design-phase CE adoption
	Staggered/phased mandates	Policy targets split into short- and long-term goals to allow industry adaptation and avoid unrealistic expectations
	Planning incentives for CE-compliant developments	Benefits like expedited approvals or additional building allowances for CE-compliant designs and materials
	Import restrictions on products with short lifespans	Ban or limit the import of products that do not meet minimum durability or longevity standards to reduce waste
Economic instruments	Low-interest loans and tax relief	Government-backed financial incentives for circular products and practices
	Council rate reductions	Provide council rate refunds based on waste reduction through responsible waste practices
	Sustained financial support for CE businesses	Long-term funding for CE startups or initiatives instead of short, one-off grants
Business and technological innovations	Digital material passports	Digital tracking of building materials to facilitate reuse and transparency
	Lifecycle assessment tools (LCA)	Standardised tools to measure environmental and material impacts across the lifecycle
	Prefabrication and modular systems	Flexible design using prefabricated elements that allow disassembly or reuse
	Design for adaptability and disassembly	Infrastructure designed for future reuse, reconfiguration or deconstruction
Education and training programs	CE in TAFE and undergraduate education	Incorporating CE principles into foundational construction education
	Public CE education	Consumer-friendly messaging to raise awareness about CE among the general public
	DfD and DfMA training	Training that incorporates design for disassembly and design for manufacture, and assembly into CE

(*continued*)

Table 3. Continued

Intervention category	Specific interventions	Explanation
Certifications and ratings	Red list/toxicity-based certification standards	Certifications that exclude materials harmful to people or the environment
	Mandatory certification requirements	Make use of sustainability certifications as a regulatory requirement
	Learning from DGNB (German CE rating system)	Adopt or adapt international systems known for CE integration
Research and development	More industry case studies	Documented CE examples that demonstrate practical implementation and success
	Better dissemination of research outputs	Ensure academic and industry findings are shared broadly and accessibly
	Community-led CE innovation	Support nonprofit and grassroots initiatives outside of formal institutions

(2020) established innovation funding and diversion targets, it does not include constriction specific mandates or phased behavioural requirements.

For Economic Instruments, experts proposed low-interest loans (new), tax relief (new) and household incentives such as council rate reductions for circular practices (new) as mechanisms to address cost related behavioural barriers. Current policies emphasise market development and landfill levies but do not extend incentives to household or other small-scale sectors.

Within Business and Technological Innovations, experts proposed digital material passports (new), standardised lifecycle assessment tools (new) and modular design strategies (new). While innovation funding is supported through initiatives like CEBIC, behavioural enablers linked to digital readiness are not embedded in policy explicitly.

In Education and Training, experts recommended embedding CE in TAFE and undergraduate curricula (new) and promoting Design for Disassembly practices (new). These align partially with education initiatives in the Sustainability Victoria (2016), although design focused training remains underdeveloped.

For Certifications and Ratings, experts called for mandatory red lists of toxic materials (new) and compulsory certifications (new), neither of which are mandated in recent policy frameworks Under Research and Development, experts emphasised industry case studies (new), broader knowledge-sharing (new) and community-led CE initiatives (new), which received limited formal policy support.

5. Discussion

This study advances behavioural research in CE adoption for C&D Waste Management by critically applying the TPB and the NAM to a sector often overlooked in behavioural frameworks. While TPB and NAM constructs, attitudes, subjective norms, perceived behavioural control, personal norms, awareness of consequences and ascribed responsibility, have been previously applied in environmental behaviour studies (Ajzen, 1991; De Groot and Steg, 2009), this research moves beyond general application by contextualising 33 empirically grounded indicators to the C&D Waste Management domain.

Many of these indicators, such as perceived cost (A1), financial incentives (PBC2) and regulatory influence (PBC4), echo dominant themes in CE literature (Mahpour, 2018; Guerra and Leite, 2021). However, this reliance on rational-economic explanations reveals a persistent gap in addressing affective, normative and organisational dimensions. This study addresses that gap by introducing underrepresented factors like digital capability (PBC5), internal company culture (SN5) and moral/emotional triggers such as climate anxiety (AC4) and anticipated shame (AR5), elements more commonly examined in environmental psychology than in construction-related CE adoption.

Furthermore, this study challenges the traditional framing of policy goals as external influences and instead posits them as internalised motivators shaping stakeholder attitudes (A3). Similarly, while peer, government and public pressure are acknowledged in existing TPB studies (Yuriev *et al.*, 2020), few studies integrate these pressures with institutional structures like procurement systems or contracting models. The findings suggest that stakeholder behaviour is shaped not only by capability or opportunity, but also by the alignment (or misalignment) of values, responsibilities and organisational support systems.

The intervention analysis reinforces this view. While existing literature supports many system-level actions (e.g. CE-specific policies, financial tools, education), this study critically reveals how many context-specific strategies, such as import restrictions, council rate reductions or material passport systems, remain under-theorised and lack behavioural

grounding. Moreover, certification systems and community-led innovation are often discussed in principle but rarely evaluated for behavioural efficacy.

The outcomes of this study highlight how behavioural insights can drive transformative change in the management of C&D waste. The validated constructs and indicators reveal that behaviour is not only shaped by cost, infrastructure and regulation but also by organisational culture, digital capability and moral responsibility. By capturing both rational and emotional dimensions, the framework provides a more comprehensive basis for understanding how stakeholders adopt circular practices. Likewise, the interventions identified here demonstrate that meaningful change requires a combination of systemic measures, such as policy and market instruments, alongside cultural and educational initiatives that embed sustainability into everyday practice. Taken together, these contributions move beyond incremental improvements in waste management to illustrate how circular practices can become embedded within the broader lifecycle of the built environment. By emphasising behavioural readiness and proposing interventions that reconfigure norms, incentives and organisational values, the study demonstrates pathways for transitioning from linear approaches to circular, regenerative practices. Such changes are central to the ongoing transformation of facilities and the built environment, supporting safer, more resilient and more sustainable spaces for future generations.

6. Conclusion

This study contributes to knowledge by developing a theory-based behavioural framework to assess CE adoption in C&D waste management within the Australian context. The framework translates stakeholder-related barriers into measurable behavioural constructs grounded in the TPB and the NAM. By linking behavioural determinants with targeted interventions, the study provides a structured explanation of how rational and moral factors influence CE adoption during the design phase.

In practice, the framework can be implemented as a behavioural assessment tool at the early design stage. Project teams can use the identified indicators to evaluate stakeholder attitudes, perceived control and responsibility before procurement and material decisions are finalised. Based on the assessment results, targeted interventions such as training, financial incentives, regulatory adjustments or digital monitoring tools can be selected to address specific behavioural gaps. This enables policymakers and industry leaders to prioritise interventions that directly respond to identified barriers. For facilities management, early behavioural alignment improves material selection, waste planning and procurement decisions, contributing to safer waste handling, improved resource efficiency and better long-term asset performance.

The framework was validated through expert interviews in Victoria, which may limit broader applicability. The study focused on behavioural determinants at the design stage. Future research should empirically test the framework in different contexts including broader stakeholder and CE principle-based applications and examine how behavioural assessment influences CE implementation outcomes.

References

Adabre, M.A., Chan, A.P.C., Darko, A. and Hosseini, M.R. (2023), "Facilitating a transition to circular economy in construction projects: intermediate theoretical models based on the theory of planned behaviour", *Building Research and Information*, Vol. 51 No. 1, pp. 85-101.

Adams, K.T., Osmani, M., Thorpe, T. and Thornback, J. (2017), "Circular economy in construction: current awareness, challenges and enablers", *Proceedings of the Institution of Civil Engineers – Waste and Resource Management*, Vol. 170 No. 1, pp. 15-24.

Ajzen, I. (1991), "The theory of planned behavior", *Organizational Behavior and Human Decision Processes*, Vol. 50 No. 2, pp. 179-211.

Ajzen, I. and Fishbein, M. (2004), "The influence of attitudes on behavior".

AlJaber, A., Martinez-Vazquez, P. and Baniotopoulos, C. (2025), "Exploring circular economy strategies in buildings: evaluating feasibility, stakeholders influence, and the role of the building lifecycle in effective adoption", *Applied Sciences (Switzerland)*, Vol. 15 No. 3, doi: 10.3390/app15031174.

Anne Dilogini, R.A., Karunasena, G., Udawatta, N. and Liu, C. (2025), "Interventions for changing behaviour of stakeholders for circular economy adoption in construction and demolition waste management", *FMF 2025 – The International Conference on Facilities Management Futures: Safety Enabled and Sustainable Facilities, University of Moratuwa*, Sri Lanka.

Antwi-Afari, P., Ng, S.T. and Hossain, M.U. (2021), "A review of the circularity gap in the construction industry through scientometric analysis", *Journal of Cleaner Production*, Vol. 298, p. 126870.

Bamberg, S. and Möser, G. (2007), "Twenty years after hines, hungerford, and tomera: a new meta-analysis of psycho-social determinants of pro-environmental behaviour", *Journal of Environmental Psychology*, Vol. 27 No. 1, pp. 14-25, doi: 10.1016/j.jenvp.2006.12.002.

Bandura (1977), "Bandura 1977", *Psychological Review, [Preprint]*.

Begum, R.A., Siwar, C., Pereira, J.J. and Jaafar, A.H. (2009), "Attitude and behavioral factors in waste management in the construction industry of Malaysia", *Resources, Conservation and Recycling*, Vol. 53 No. 6, pp. 321-328, doi: 10.1016/j.resconrec.2009.01.005.

Bertolotti, F. and Roman, S. (2024), "Balancing long-term and short-term strategies in a sustainability game", *iScience*, Vol. 27 No. 6, doi: 10.1016/j.isci.2024.110020.

Blue Environment Pty Ltd (2022), *National Waste Report 2022: Final report, version 1.2*. Melbourne: Blue Environment Pty Ltd. Prepared for the Department of Climate Change, Energy, the Environment and Water.

Campbell-Johnston, K., Vermeulen, W.J.V., Reike, D. and Brullot, S. (2019), "The circular economy and barriers to its implementation in the construction sector", *Journal of Cleaner Production*, Vol. 231, pp. 1235-1244.

Chakraborty, A., Lizarelli, F.L., O'Loughlin, A. and Barton, A.F. (2024), "Empirical evidence on circular economy adoption in Australian small and medium enterprises", *Journal of Cleaner Production*, Vol. 467, doi: 10.1016/j.jclepro.2024.142958.

Charef, R., Morel, J.-C. and Rakhshan, K. (2021), "Barriers to implementing the circular economy in the construction industry: a critical review", *Sustainability*, Vol. 13 No. 23, p. 12989.

Circle Economy (2023), "The circularity gap report 2023", Amsterdam: Circle Economy, available at: www.circularity-gap.world/2023 (accessed 6 July 2025).

Constantino, S.M., Schlüter, M., Weber, E.U. and Wijermans, N. (2021), "Cognition and behavior in context: a framework and theories to explain natural resource use decisions in social-ecological systems", *Sustainability Science*, Vol. 16 No. 5, pp. 1651-1671, doi: 10.1007/s11625-021-00989-w.

De Groot, J.I.M. and Steg, L. (2009), "Morality and prosocial behavior: the role of awareness, responsibility, and norms in the norm activation model", *The Journal of Social Psychology*, Vol. 149 No. 4, pp. 425-449.

Debnath, A. and Sarkar, B. (2023), "Effect of circular economy for waste nullification under a sustainable supply chain management", *Journal of Cleaner Production*, p. 385, doi: 10.1016/j.jclepro.2022.135477.

Department of Environment, Land, Water and Planning (DELWP) (2020), *Recycling Victoria: A New Economy*, State Government of Victoria, Melbourne.

Ding, Z., Wen, X., Zuo, J. and Chen, Y. (2023), "Determinants of contractor's construction and demolition waste recycling intention in China: integrating theory of planned behavior and norm activation model", *Waste Management*, Vol. 161, pp. 213-224, doi: 10.1016/j.wasman.2023.03.005.

Dunant, C.F., Drewniok, M.P., Sansom, M., Corbey, S., Allwood, J.M. and Cullen, J.M. (2017), "Real and perceived barriers to steel reuse across the UK construction value chain", *Resources, Conservation and Recycling*, Vol. 126, pp. 118-131.

Ellen MacArthur Foundation (2021), "What is a circular economy?", available at: www.ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview (accessed 6 July 2025).

Elmualim, A., Valle, R. and Kwawu, W. (2012), "Discerning policy and drivers for sustainable facilities management practice", *International Journal of Sustainable Built Environment*, Vol. 1 No. 1, pp. 16-25, doi: 10.1016/j.ijsbe.2012.03.001.

Environment Protection Act (Vic.) (2017), Victorian Government, Melbourne.

Geissdoerfer, M., Savaget, P., Bocken, N.M.P. and Hultink, E.J. (2017), "The circular economy – a new sustainability paradigm?", *Journal of Cleaner Production*, Vol. 143, pp. 757-768, doi: 10.1016/j.jclepro.2016.12.048.

Ghaffar, S.H., Burman, M. and Braimah, N. (2020), "Pathways to circular construction: an integrated management of construction and demolition waste for resource recovery", *Journal of Cleaner Production*, Vol. 244, doi: 10.1016/j.jclepro.2019.118710.

Ghisellini, P., Ripa, M. and Ulgiati, S. (2018), "Exploring environmental and economic costs and benefits of a circular economy approach to the construction and demolition sector. A literature review", *Journal of Cleaner Production*, Vol. 178, pp. 618-643, doi: 10.1016/j.jclepro.2017.11.207.

Grafström, J. and Aasma, S. (2021), "Breaking circular economy barriers", *Journal of Cleaner Production*, Vol. 292, p. 126002.

Guerra, B.C. and Leite, F. (2021), "Circular economy in the construction industry: an overview of United States stakeholders' awareness, major challenges, and enablers", *Resources, Conservation and Recycling*, Vol. 170, p. 105617.

Haessler, P. (2020), "Strategic decisions between short-term profit and sustainability", *Administrative Sciences*, Vol. 10 No. 3, doi: 10.3390/admsci10030063.

Huang, J., Abadi, M. and Yeow, J. (2023), "Policies for the transition to circular construction: a systematic literature review", in Chinowsky, P. and Watt, I. (Eds), *Proceedings of the 39th Annual ARCOM Conference, Association of Researchers in Construction Management*, pp. 741-750.

Kaewunruen, S., Teuffel, P., Donmez Cavdar, A., Valta, O., Tambovceva, T. and Bajare, D. (2024), "Comparisons of stakeholders' influences, inter-relationships, and obstacles for circular economy implementation on existing building sectors", *Scientific Reports*, Vol. 14 No. 1, p. 11046, doi: 10.1038/s41598-024-61863-0.

Kallio, H., *et al*. (2016), "Systematic methodological review: developing a framework for a qualitative semi-structured interview guide", *Journal of Advanced Nursing. Blackwell Publishing Ltd*, Vol. 72 No. 12, pp. 2954-2965, doi: 10.1111/jan.13031.

Kaluarachchi, M., Waidyasekara, A.S., Rameezdeen, R. and Chileshe, N. (2021), "Mitigating dust pollution from construction activities: a behavioural control perspective", *Sustainability*, Vol. 13 No. 16, p. 9005.

Kirchherr, J., Hekkert, M., Bour, R., Huibrechtse-Truijens, A., Kostense-Smit, E. and Muller, J. (2017), "Breaking the barriers to the circular economy".

Lee, S. (2023), "Material efficiency for the circular economy", *KIET Industrial Economic Review*, Korea Institute for Industrial Economics and Trade Research Paper No. 23/IER/28/3/3, Vol. 28 No. 3, pp. 22-35.

Li, Q.C. and Wu, M.Y. (2019), "Rationality or morality? A comparative study of pro-environmental intentions of local and nonlocal visitors in nature-based destinations", *Journal of Destination Marketing and Management*, Vol. 11, pp. 130-139, doi: 10.1016/j.jdmm.2019.01.003.

Linder, M. and Williander, M. (2017), "Circular business model innovation: inherent uncertainties", *Business Strategy and the Environment*, Vol. 26 No. 2, pp. 182-196, doi: 10.1002/bse.1906.

Mahpour, A. (2018), "Prioritizing barriers to adopt circular economy in construction and demolition waste management", *Resources, Conservation and Recycling*, Vol. 134, pp. 216-227.

Mubarik, M.S., Kontoleon, A. and Shahbaz, M. (2024), "Beyond the hurdles: exploring policy obstacles in the path to circular economy adoption", *Journal of Environmental Management*, Vol. 370, doi: 10.1016/j.jenvman.2024.122667.

Munaro, M.R. and Tavares, S.F. (2023), "A review on barriers, drivers, and stakeholders towards the circular economy: the construction sector perspective", *Cleaner and Responsible Consumption*, Vol. 8, doi: 10.1016/j.clrc.2023.100107.

National Waste Policy (2018), *Less Waste, More Resources*, Australian Government, Canberra.

Nujen, B.B., Kvadsheim, N.P., Mwesiumo, D., Reke, E. and Powell, D. (2023), "Knowledge obstacles when transitioning towards circular economy: an industrial intra-organisational perspective", *International Journal of Production Research*, Vol. 61 No. 24, pp. 8618-8633, doi: 10.1080/00207543.2022.2158243.

Park, W.-J., Kim, R., Roh, S. and Ban, H. (2020), "Identifying the major construction wastes in the building construction phase based on life cycle assessments", *Sustainability*, Vol. 12 No. 19, p. 8096.

Ramos, M., Martinho, G. and Pina, J. (2023), "Strategies to promote construction and demolition waste management in the context of local dynamics", *Waste Management*, Vol. 162, pp. 102-112.

Ranta, V., Aarikka-Stenroos, L., Ritala, P. and Mäkinen, S.J. (2018), "Exploring institutional drivers and barriers of the circular economy: a cross-regional comparison of China, the US, and Europe", *Resources, Conservation and Recycling*, Vol. 135, pp. 70-82, doi: 10.1016/j.resconrec.2017.08.017.

Sajid, Z.W., Aftab, U. and Ullah, F. (2024), "Barriers to adopting circular procurement in the construction industry: the way forward", *Sustainable Futures*, Vol. 8, p. 100244.

Schwartz, S.H. (1977), "'Normative influences on altruism", in Berkowitz, L. (Ed.), *Advances in Experimental Social Psychology*, Academic Press, New York, NY, Vol. 10, pp. 221-279, doi: 10.1016/S0065-2601(08)60358-5.

Shooshtarian, S., Maqsood, T., Wong, P.S.P., Yang, R., Khalfan, M., Xie, X. and Tauti-Mohamed, M. (2022), "An investigation into challenges and opportunities in the Australian construction and demolition waste management system", *Engineering, Construction and Architectural Management*, Vol. 29 No. 10, pp. 4313-4330, doi: 10.1108/ECAM-05-2021-0439.

Stern, P.C., Dietz, T., Abel, T., Guagnano, G.A. and Kalof, L. (1999), "A Value-Belief-Norm theory of support for social movements: the case of environmentalism recommended citation", available at: https://cedar.wwu.edu/hcop_facpubs

Sustainability Victoria (2016), *Victorian Waste Education Strategy*, Sustainability Victoria, Melbourne.

Sustainability Victoria (2018), "Statewide waste and resource recovery infrastructure plan (SWRRIP)", *Sustainability Victoria, Melbourne*, available at: www.sustainability.vic.gov.au/about-us/state-government-strategicplans/statewide-waste-and-resource-recovery-infrastructure-plan-swrrip (accessed 16 July 2026).

Takacs, F., Brunner, D. and Frankenberger, K. (2022), "Barriers to a circular economy in small- and medium-sized enterprises and their integration in a sustainable strategic management framework", *Journal of Cleaner Production*, Vol. 362, doi: 10.1016/j.jclepro.2022.132227.

Tam, V.W.Y. and Tam, C.M. (2009), "Parameters for assessing recycled aggregate and their correlation", *Waste Management and Research: The Journal for a Sustainable Circular Economy*, Vol. 27 No. 1, pp. 52-58, doi: 10.1177/0734242X07079875.

Tokede, O.O., Rodgers, G., Waschl, B., Salter, J. and Ashraf, M. (2022), "Harmonising life cycle sustainability thinking in material substitution for buildings", *Resources, Conservation and Recycling*, Vol. 185, p. 106468.

Tongco, M.D.C. (2007), "Purposive sampling as a tool for informant selection", *Ethnobotany Research and Applications*, Vol. 5, pp. 147-158.

Torres Curado, M., Resende, R. and Rato, V.M. (2024), "Circular economy: current view from the construction industry based on published definitions", *Sustainability: Science, Practice, and Policy*, Vol. 20 No. 1, doi: 10.1080/15487733.2024.2364954.

Urbinati, A., Shams Esfandabadi, Z. and Messeni Petruzzelli, A. (2023), "Assessing the interplay between open innovation and sustainability-oriented innovation: a systematic literature review and a research agenda", *Business Ethics, the Environment and Responsibility*, Vol. 32 No. 3, pp. 1078-1095, doi: 10.1111/beer.12540.

Valencia, M., Bocken, N., Loaiza, C. and De Jaeger, S. (2023), "The social contribution of the circular economy", *Journal of Cleaner Production*, Vol. 408, doi: 10.1016/j.jclepro.2023.137082.

Van Langen, S.K., Vassillo, C., Ghisellini, P., Restaino, D., Passaro, R. and Ulgiati, S. (2021), "Promoting circular economy transition: a study about perceptions and awareness by different stakeholders groups", *Journal of Cleaner Production*, Vol. 316, doi: 10.1016/j.jclepro.2021.128166.

Victoria (2017), "Environment protection act 2017 (vic), No. 51/2017", State Government of Victoria, Melbourne.

Yuriev, A., Dahmen, M., Paillé, P., Boiral, O. and Guillaumie, L. (2020), "Pro-environmental behaviors through the lens of the theory of planned behavior: a scoping review", *Resources, Conservation and Recycling*, Vol. 155, p. 104660.

Zhao, X. (2021), "Stakeholder-associated factors influencing construction and demolition waste management: a systematic review", *Buildings. MDPI AG*, Vol. 11 No. 4, doi: 10.3390/buildings11040149.

Zuo, J., Rameezdeen, R., Hagger, M., Zhou, Z. and Ding, Z. (2017), "Dust pollution control on construction sites: awareness and self-responsibility of managers", *Journal of Cleaner Production*, Vol. 166, pp. 312-320.

Further reading

CE-Hub (2022), "Demystifying series: consumers, behaviour change and a circular economy", available at: https://ce-hub.org/knowledge-hub/demystifying-series-consumers-behaviour-change-and-a-circular-economy/ (accessed 10 July 2026).

Charef, R., Emmitt, S., Alaka, H. and Fouchal, F. (2019), "Building information modelling adoption in the European Union: an overview", *Journal of Building Engineering*, Vol. 25, p. 100777.

Feldman, J., Seligmann, H., King, S., Flynn, M., Shelley, T., Helwig, A. and Burey, P. (. (2024), "Circular economy barriers in Australia: how to translate theory into practice?", *Sustainable Production and Consumption*, Vol. 45, pp. 582-597.

Javid, M.A., Ali, N., Shah, S.A.H. and Abdullah, M. (2022), "Structural equation modeling of drivers' speeding behavior in Lahore: importance of attitudes, personality traits, behavioral control, and traffic awareness", *Iranian Journal of Science and Technology, Transactions of Civil Engineering*, Vol. 46 No. 2, pp. 1607-1619.

Kaiser, F.G., Hübner, G. and Bogner, F.X. (2005), "Contrasting the theory of planned behavior with the value-belief-norm model in explaining conservation behavior", *Journal of Applied Social Psychology*, Vol. 35 No. 10, pp. 2150-2170.

Munir, Q., Lahtela, V., Kärki, T. and Koivula, A. (2024), "Assessing life cycle sustainability: a comprehensive review of concrete produced from construction waste fine fractions", *Journal of Environmental Management*, Vol. 366, p. 121734.

OECD (2021), *Individual Behaviour and Circular Economy Policies*, OECD Publishing, Paris, doi: 10.1787/7bd89d46-en.

Oluleye, B.I., Chan, D.W.M. and Olawumi, T.O. (2022), "Barriers to circular economy adoption and concomitant implementation strategies in building construction and demolition waste management: a PRISMA and interpretive structural modeling approach", *Habitat International*, Vol. 126, p. 102615.

Parajuly, K., Fitzpatrick, C., Muldoon, O. and Kuehr, R. (2020), "Behavioral change for the circular economy: a review with focus on electronic waste management in the EU", *Resources, Conservation and Recycling*, Vol. 6, p. 100035.

Salmenperä, H., Pitkänen, K., Kautto, P. and Saikku, L. (2021), "Critical factors for enhancing the circular economy in waste management", *Journal of Cleaner Production*, Vol. 280, p. 124339.

Shahbazi, S., Wiktorsson, M., Kurdve, M., Jönsson, C. and Bjelkemyr, M. (2016), "Material efficiency in manufacturing: Swedish evidence on potential, barriers and strategies", *Journal of Cleaner Production*, Vol. 127, pp. 438-450.

The Great Recovery (2014), "Part 1: behaviour change towards a circular economy", available at: www.greatrecovery.org.uk/resources/behaviour-change-towards-a-circular-economy-part-1/ (accessed 10 July 2026).

The Recycling Partnership (2023), "Accelerating behavior change to achieve a circular economy", available at: https://recyclingpartnership.org/wp-content/uploads/dlm_uploads/2023/06/Recycling-Partnership-Center-Sustainable-Behavior-Knowledge-report2.pdf (accessed 10 July 2026).

Corresponding author
Gayani Karunasena can be contacted at: gayani.karunasena@deakin.edu.au