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Engaging the Loop: A Conceptual Framework Linking Stakeholder Engagement to Circular Economy Adoption for Waste Reduction

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Abstract: This study addresses persistent challenges in municipal solid waste systems, namely low diversion and uneven resource recovery, by examining how stakeholder engagement (with communities, suppliers, and regulators) supports the adoption of circular economy (CE) practices and how operational change, often termed green process innovation, drives measurable waste outcomes. The central hypothesis is that CE adoption mediates the relationship between stakeholder engagement and waste reduction. Using a narrative review oriented to concept development, records were retrieved from the Scopus database (articles and reviews, 2000–2025, English) with a reproducible query targeting stakeholder engagement, CE, policy/strategy, and organizational settings. After de-duplication, titles/abstracts and full texts were screened for relevance to engagement, CE adoption, and waste outcomes or proxies; data were extracted into a concept-centric matrix and synthesized via integrative thematic analysis. Primary outcomes were diversion rate, secondary material yield, and contamination reduction. The synthesis reveals two pathways: (1) a direct association whereby engagement mobilizes source separation, social acceptance of reuse/repair, and take-back participation; and (2) a stronger, mediated pathway in which engagement enables CE adoption, such as design for disassembly, industrial symbiosis, organics valorization, and optimized recycling–recovery portfolios that directly improves diversion and recovery. Governance capacity, policy coherence, and digital readiness strengthen these effects. Overall, stakeholder engagement improves waste outcomes primarily by deepening and routinizing CE adoption, with supportive governance and policy environments amplifying gains. The resulting framework offers testable propositions and practical guidance for municipalities and firms seeking scalable circular outcomes.

Keywords: *Circular economy adoption; Green process innovation; Municipal solid waste; Stakeholder engagement; Waste reduction*

1. Introduction and Background

The transition to a circular economy (CE) is increasingly viewed as a necessary response to the limits of linear "take–make–dispose" systems and the escalating costs and risks of waste (including social license risks). A growing body of work shows that CE programs can improve organizational and municipal performance when they are accompanied by authentic, structured stakeholder engagement, i.e., purposeful interaction with regulators, supply-chain partners, communities, and employees to co-define priorities and practices (Esposito et al., 2024; Palafox-Alcantar et al., 2021). In urban settings, integrative CE frameworks (e.g., 10R/9Rs ladders and inclusive circular city models) emphasize multi-actor collaboration to drive waste reduction and resource recovery outcomes (Toboso-Chavero et al., 2025).

Across sectors, the literature links engagement to concrete circular practices. Oil and gas firms use engagement to legitimize and accelerate new recovery and waste-to-fuel pathways (Adedayo-Ojo et al., 2025); construction studies show that early, continuous stakeholder involvement reduces construction and demolition waste by

enabling circular material value chains (She et al., 2025); manufacturing evidence associates open communication and green image with deeper CE adoption (Kunal et al., 2025). Corporate governance mechanisms—such as board oversight, sustainability reporting, and cross-functional environmental teams—act as an engagement "infrastructure" that normalizes circular decision-making (Palea et al., 2025). Together, these streams suggest a plausible pathway from stakeholder engagement to CE adoption and then to waste reduction.

Yet practice and outcomes remain uneven. Studies note coordination failures, conflicting stakeholder objectives, and capability gaps that impede scaling, even when interest in CE is high (Palafox-Alcantar et al., 2021; She et al., 2025). Engagement is often treated as a generic "good practice," while the mechanism by which it changes processes and investments is under-specified; conversely, CE adoption is sometimes measured as a checklist rather than a dynamic organizational process. This fragmentation obscures how engagement quality, breadth, and depth translate into adoption intensity and, ultimately, measurable diversion, recovery, and cost/safety benefits (Esposito et al., 2024; Palea et al., 2024).

To address this, the paper proposes a conceptual framework in which stakeholder engagement (independent variable) improves circular economy adoption (mediating variable), capturing the depth, scope, and routinization of circular practices, which in turn increases waste reduction (dependent variable). The framework is theory-informed by Stakeholder Theory (salience and responsiveness), Institutional Theory (legitimacy and policy signals), and the Natural Resource-Based View/Dynamic Capabilities (sensing–seizing–reconfiguring to embed CE routines) (Palea et al., 2024; Esposito et al., 2024; Kunal et al., 2025). It yields testable propositions regarding mediation and likely moderators (e.g., governance strength, digital readiness, sectoral hazard profile, and community pressure), and applies to municipal, industrial, and healthcare contexts where hazardous and non-hazardous streams intersect (Saha et al., 2025; Adedayo-Ojo et al., 2025).

The study contributes by (i) integrating dispersed insights into a coherent, testable mechanism (engagement → adoption → outcomes), (ii) specifying measurable constructs and boundary conditions useful to researchers and practitioners, and (iii) offering a policy-relevant lens for designing engagement-anchored CE roadmaps (Toboso-Chavero et al., 2025; Palea et al., 2024). The paper proceeds as follows: an Introduction sets the context and problem; a Literature Review synthesizes evidence on engagement, CE adoption, and performance; the Theoretical Framework elaborates the proposed mediation and moderators; a Discussion outlines implications for governance, program design, and evaluation; and a Conclusion highlights contributions and a future research agenda (e.g., multi-industry surveys and panel analyses) to operationalize and empirically test the framework (Esposito et al., 2024; Palafox-Alcantar et al., 2021).

2. Literature Review

Scholarship consistently positions stakeholder engagement as a pivotal antecedent to circular economy (CE) adoption across public and private settings, with implications for waste reduction. Cooperation and readiness among actors (e.g., local authorities, firms, communities) are repeatedly identified as enabling conditions for CE transitions in practice (Palafox-Alcantar et al., 2021). Sectoral studies further emphasize *early* and *continuous* engagement to co-design circular practices such as circular material value chains that minimize construction and demolition waste, thereby aligning incentives and reducing implementation frictions (She et al., 2025). At the firm level, corporate governance and social performance mechanisms operate as engagement infrastructure, shifting organizations from compliance to commitment and correlating with deeper CE initiatives (Al-Najjar et al., 2025). Taken together, the literature indicates that engagement influences both the legitimacy and the operationalization of CE practices, while governance capacity at multiple levels (city, sector, firm) shapes adoption pathways (Ddiba et al., 2020). Aim of study: How does stakeholder engagement influence circular economy adoption for waste reduction?

Mechanistically, studies show that engagement translates into CE adoption when it catalyzes information sharing, joint problem-solving, and transparent communication of green practices; these, in turn, are associated with stronger uptake of circular routines in manufacturing and allied sectors (Kunal et al., 2025). Evidence also suggests performance payoffs: CE performance is more strongly linked to financial outcomes when stakeholder engagement is present, implying that engagement not only accelerates adoption but also stabilizes business

value around circular practices (Esposito et al., 2024). In public services and complex value chains (e.g., agri-food, municipal services), research depicts CE adoption as a shared responsibility among heterogeneous actors; however, limited analysis of stakeholder interactions and coordination dynamics remains a bottleneck for designing scalable collaborative strategies (Muriuki et al., 2024). In healthcare and other regulated domains, reviews document a bias toward operational challenges (e.g., regulatory, infrastructural) and call for attention to *systemic enablers,* policy coherence and cross-level collaboration that engagement processes can help unlock (Ddiba et al., 2020).

Despite these advances, the literature is fragmented on the specific pathway connecting engagement to measurable waste outcomes. Few studies model engagement → CE adoption → waste reduction as an integrated causal sequence or explore contingencies under which engagement is most efficacious (e.g., governance strength, policy coherence, and sectoral context). Addressing this gap, the present study proposes a conceptual framework in which stakeholder engagement (independent variable) enhances CE adoption (mediating variable), which subsequently improves waste reduction (dependent variable). This framework consolidates scattered insights into a testable mechanism that (i) clarifies how engagement is converted into organizational routines and inter-organizational agreements constituting CE adoption, and (ii) specifies outcome-relevant indicators (e.g., diversion rates, secondary material yields) for future empirical validation across municipal and industry contexts (Al-Najjar et al., 2025; Esposito et al., 2024; Kunal et al., 2025; Palafox-Alcantar et al., 2021).

3. Method

Research Design

This study employs a narrative review to build theory and integrate heterogeneous findings across environmental management, operations, and public policy, consistent with best practice for concept development and proposition building (Baumeister & Leary, 1997; Snyder, 2019). A narrative review is appropriate because the aim is to propose a conceptual framework that explains how circular economy (CE) capabilities drive municipal waste diversion via green process innovation (GPI), a question that spans diverse methods, sectors, and vocabularies rather than a single, tightly bounded empirical stream. Following guidance for concept-centric synthesis, we organize evidence around the constructs (CE capabilities → GPI → waste diversion), mechanisms, and boundary conditions (e.g., policy stringency, digital readiness, governance capacity), rather than study-by-study summaries (Webster & Watson, 2002). This design privileges theoretical integration, clarity of constructs and relationships, and identification of testable propositions, while transparently reporting search, screening, and synthesis procedures to enhance credibility (Snyder, 2019).

Key Steps in Conducting a Narrative Review

Data collection was conducted exclusively with Scopus (Elsevier), chosen for its broad coverage of environmental science, engineering, energy, and management journals. We iteratively developed and piloted Boolean strings using Scopus' *TITLE-ABS-KEY* field, wildcards, and proximity operators. Inclusion criteria: peer-reviewed journal articles and reviews; English (and, where available, Malay) full texts; publication years 2000–2025; clear relevance to at least two focal constructs (CE capabilities, GPI, diversion/recovery) or to moderators/policy instruments shaping those links. Exclusion criteria: these, non-archival conference abstracts, non-municipal hazardous-only streams unless explicitly tied to municipal systems, and purely technical treatment papers without organizational or policy interfaces. The workflow comprised: (1) query execution and export of records (CSV/BibTeX) with bibliographic metadata; (2) de-duplication in a reference manager; (3) title/abstract screening against criteria; (4) full-text screening for conceptual relevance; and (5) citation chaining (backward/forward) within Scopus to capture seminal and adjacent works. To limit selection bias, a second reviewer verified a 20% random sample at each screening stage, and disagreements were resolved by discussion with an audit trail (Page et al., 2021; Snyder, 2019).

Data extraction, synthesis and rigor

For each included study, we extracted: study type, context/region, definitions/operationalizations of CE capabilities, forms of GPI (e.g., source-separation, contamination control, routing and sorting innovations, repair/reuse hubs), outcome measures (diversion rate, material recovery yield), mechanisms (e.g., learning, governance, digitalization), and boundary conditions (policy instruments, financing, stakeholder engagement).

We then built a concept-centric evidence matrix to identify convergences, contradictions, and gaps, and conducted a narrative thematic synthesis that explicitly maps evidence to the proposed mediated pathway (CE capabilities → GPI → diversion), culminating in propositions and a diagram of the conceptual framework (Webster & Watson, 2002). Although formal risk-of-bias tools are uncommon in narrative reviews, we applied a light-touch appraisal (clarity of constructs, methodological transparency, and plausibility of inferences) to weight studies during synthesis, documented reflexive memos on selection decisions, and report a flow overview (identification → screening → inclusion) for transparency (Page et al., 2021). Ethical approval was not required (no human subjects), but we adhered to good scholarly practice in accurate citation, reproducible search strings, and archiving of screening logs to support future replication (Snyder, 2019).

Data source and search strategy

We conducted all searches in Scopus (Elsevier) because of its broad coverage across environmental science, engineering, management, and policy journals, domains central to stakeholder engagement and circular economy (CE). To balance recall and precision, we first piloted synonyms and then executed a field-limited search using Scopus' TITLE-ABS-KEY operator. The *base query* (kept verbatim for reproducibility) was:
("stakeholder" OR "participant" OR "involvement" OR "engagement") AND ("engagement" OR "participation" OR "involvement" OR "collaboration") AND ("circular economy" OR "sustainable economy" OR "closed-loop economy" OR "resource efficiency") AND ("sustainability" OR "environment" OR "eco-friendly" OR "green") AND ("policy" OR "strategy" OR "framework" OR "approach") AND ("business" OR "industry" OR "sector" OR "organization").

We implemented this as TITLE-ABS-KEY(<query>) and limited results to (i) document types: articles and reviews; (ii) language: English; and (iii) years: 2000–2025 to capture two decades of CE scholarship. Sensitivity checks varied fields (e.g., adding keywords) and used proximity operators where noise was high (e.g., replacing one of the doubled engagement blocks with stakeholder W/3 engagement), and we ran citation chaining (backward/forward) on frequently cited items surfaced by the core search. Search results (CSV/BibTeX) with full metadata were exported for screening and synthesis (Snyder, 2019; Webster & Watson, 2002).

Screening, inclusion/exclusion, and audit trail. After de-duplication in a reference manager, we applied a two-stage screen. *Title/abstract screening* retained records that explicitly addressed: (1) stakeholder engagement/participation (any actor set: municipal, industry, community, NGO); (2) CE adoption (policies, practices, business models, or governance mechanisms); and (3) waste reduction outcomes or proxies (e.g., diversion, secondary material yield). We excluded these: editorials, purely technical papers lacking engagement or adoption constructs, and sectoral contexts unrelated to municipal or industry waste systems. *Full-text screening* verified construct clarity and relevance to the proposed mechanism (engagement → CE adoption → waste outcomes). To increase rigor, a second reviewer checked a 20% random sample at each step independently; disagreements were resolved by discussion, and records were taken to ensure an audit trail is consistent with PRISMA-style levels of transparency (Page et al., 2021). The latter corpus consisted of both empirical and theoretical works, which is aligned to the requirements of an integrative review, i.e. to synthesize heterogeneous evidence (Whittemore & Knafl, 2005).

Integrative thematic analysis and synthesis. We used an integrative thematic analysis approach to identify and connect key themes, concepts, and theoretical perspectives across the included studies (Braun & Clarke, 2006; Whittemore & Knafl, 2005). Following a concept-centric protocol (Webster & Watson, 2002; Miles et al., 2014), we: (1) familiarized ourselves with the corpus; (2) developed an a priori codebook anchored to the study aim: How does stakeholder engagement influence circular economy adoption for waste reduction? With parent codes for Stakeholder Engagement (e.g., breadth/depth, governance mechanisms, participation quality), CE Adoption (policies, practices, business models, routinization), and Outcomes (diversion, recovery, contamination reduction), plus Context/Moderators (policy coherence, sector, digital readiness); (3) performed iterative coding (inductive refinements added new subcodes such as co-creation mechanisms, legitimacy seeking, and cross-sector alliances); (4) generated candidate themes (e.g., "engagement as governance infrastructure," "engagement-to-adoption via learning and legitimacy," "conditions under which engagement translates to measurable diversion"); (5) reviewed and defined themes, checking coherence across studies and reconciling conflicting findings; and (6) constructed a narrative synthesis that maps themes onto the proposed conceptual framework (Engagement → CE Adoption → Waste Reduction), articulating

propositions and boundary conditions. Reliability was supported by a pilot coding of ~10% of studies (refining code definitions), periodic adjudication between coders, and reflexive memos to document interpretive choices. Limitations (e.g., English-only bias, database dependence) were mitigated through citation chaining and sensitivity checks on the query, while preserving replicability via shared strings and logs (Snyder, 2019; Braun & Clarke, 2006). A synthesis of key findings is provided in Table 1.

Table 1: Key findings of Stakeholder Engagement to Circular Economy Adoption for Waste Reduction

No	Key findings (theme)	Brief description	Illustrative sources
1	Engagement amplifies the CE performance–value link.	Organizations that engage stakeholders (customers, communities, regulators, suppliers) translate CE practices into stronger financial/performance payoffs, which in turn sustain adoption.	Esposito et al., 2024
2	Early, continuous engagement reduces implementation frictions	Early involvement of key actors aligns incentives, clarifies roles, and enables circular material value chains (e.g., C&D waste minimization).	She et al., 2025
3	Governance acts as an engagement infrastructure.	Board oversight, CSR, and disclosure institutionalize engagement, shifting firms from compliance to commitment and deepening CE initiatives.	Al-Najjar et al., 2025
4	Cooperation/readiness are preconditions for municipal CE	In municipal systems, cooperation across public agencies, contractors, and citizens is necessary; gaps often persist between awareness and practice.	Palafox-Alcantar et al., 2021
5	Policy coherence and cross-level collaboration enable scaling	Policy coherence, multi-level governance, and cross-sector collaboration raise the capacity to adopt circular resource-recovery systems (especially in LMICs).	Ddiba et al., 2020
6	Sectoral contexts shape engagement mechanisms.	In sectors like oil & gas and construction, engagement legitimizes higher-risk CE options (e.g., waste-to-fuel, carbon capture) and coordinates complex value chains.	Adedayo-Ojo et al., 2025; She et al., 2025
7	Communication quality drives internal CE adoption	Clear communication of green practices and a visible green image correlate with deeper CE adoption in manufacturing and supply chains.	Kunal et al., 2025
8	"Circular stakeholder engagement" extends scope, topics, and modes	Firms progress by expanding with whom they engage (beyond immediate suppliers), on what (design, take-back), and how (co-creation), moving beyond linear engagement routines.	Fobbe & Hilletofth, 2023
9	Urban CE benefits from multi-stakeholder orchestration	City programs that orchestrate industrial symbiosis, waste-to-energy, reuse and mobility solutions rely on multi-stakeholder platforms to unlock synergies and social acceptance.	Salles et al., 2024
10	Research/practice gaps: interactions, enablers, regulated settings	Literature over-emphasizes operational hurdles and under-specifies interaction mechanisms; regulated domains (e.g., healthcare) need attention to systemic enablers.	Saha et al., 2025

Collectively, the evidence shows that stakeholder engagement is a primary enabler of CE adoption and a bridge to waste reduction. Engagement strengthens the value case for CE by improving the translation of CE practices into financial and operational performance (Finding 1) and reduces implementation frictions when it begins early and continues through project lifecycles (Finding 2). At the organization level, governance mechanisms (board oversight, CSR, transparency) function as a durable engagement infrastructure that shifts CE from one-off initiatives to routinized strategies (Finding 3). In public systems, cooperation and readiness across

municipalities, service providers, and communities remain decisive; however, studies document a persistent intent–action gap that constrains diversion and recovery (Finding 4). Where policy is coherent and collaboration spans levels of government and sectors, the capacity to implement circular solutions, especially for organic waste/resource-oriented sanitation, improves markedly (Finding 5).

Context matters: high-hazard and infrastructure-intensive sectors (e.g., oil & gas, construction) use engagement both for legitimacy and coordination of complex, risk-sensitive circular options (Finding 6). Inside firms and supply chains, communication quality and green image signal credibility and mobilize internal adoption behaviors (Finding 7), while circular stakeholder engagement practices push organizations to broaden who is at the table, what topics are negotiated (e.g., design for disassembly, take-back), and how collaboration occurs (co-creation vs. consultation) (Finding 8). At the city scale, multi-stakeholder orchestration underpins industrial symbiosis, reuse markets, and energy recovery portfolios that raise diversion and recovery (Finding 9). Finally, the literature still under-specifies interaction mechanisms and systemic enablers in highly regulated arenas (e.g., healthcare), pointing to a need for frameworks that model engagement → adoption → outcome pathways with clear mediators and moderators (Finding 10). These insights directly support the paper's conceptual framework: stakeholder engagement (IV) improves CE adoption (mediator), which then drives waste reduction (DV), contingent on governance strength, policy coherence, and sectoral context.

4. Theoretical Framework

This study explains how stakeholder engagement influences circular economy (CE) adoption to achieve waste reduction by integrating Stakeholder Theory (value creation with/for salient stakeholders), Institutional Theory (legitimacy, policy pressure, and field logics), and the Natural Resource–Based View (NRBV) with Dynamic Capabilities (sensing–seizing–reconfiguring environmental opportunities) (Freeman, 1984; Mitchell et al., 1997; DiMaggio & Powell, 1983; Hart, 1995; Teece et al., 1997). Conceptually, CE provides the sustainability paradigm that reframes material flows and business models (Kirchherr et al., 2017; Geissdoerfer et al., 2017; Ghisellini et al., 2016). Applied to municipal waste systems and urban/industrial networks, Stakeholder Theory clarifies who must be engaged and why (citizens, NGOs, suppliers, regulators), Institutional Theory explains how policy coherence and field norms catalyze CE routines, and NRBV/Dynamic Capabilities specify how organizations convert engagement into process changes that yield diversion and recovery outcomes (Ddiba et al., 2020; Palafox-Alcantar et al., 2021; Esposito et al., 2024).

The framework models Stakeholder Engagement (IV) → CE Adoption (Mediator) → Waste Reduction (DV7). Stakeholder engagement is conceptualized as breadth (actor inclusivity), depth (co-creation vs. consultation), and quality (trust, transparency); it delivers legitimacy (Institutional Theory) and access to knowledge/resources (Stakeholder Theory), which together enable Dynamic Capabilities for CE (Freeman, 1984; DiMaggio & Powell, 1983; Teece et al., 1997). CE adoption denotes the routinization of circular practices (design for disassembly, take-back, source separation, industrial symbiosis), which literature links to improved performance when coupled with communication and governance mechanisms (Fobbe & Hilletofth, 2023; Kunal et al., 2025; She et al., 2025). Measurement of the outcomes is done through diversion rates, secondary-material yields, and waste reduction, which are in line with CE definitions and empirical research (Kirchherr et al., 2017; Geissdoerfer et al., 2017; Palafox-Alcantar et al., 2021). The mediation of CE adoption is evidenced by the fact that the engagement increases the CE performance relationship (Esposito et al., 2024); the mediation of the participants by the governance capacity and policy coherence (Ddiba et al., 2020) points to the existence of boundary conditions. Therefore, stakeholder engagement leads to legitimacy and common problem-solving (Institutional/Stakeholder), which triggers capability building and green process innovation that are the basis of CE adoption (NRBV/Dynamic Capabilities) and finally realizes quantifiable waste results.

Practically, the framework yields a diagnostic for municipalities and firms: (i) map stakeholder salience and upgrade engagement from consultation to co-creation; (ii) strengthen governance infrastructure (board oversight, disclosure, cross-sector platforms); (iii) target capability investments that translate engagement into CE routines (e.g., source-separation quality programs, repair/reuse hubs, circular procurement); and (iv) align with institutional levers (policy coherence, standards) to reduce adoption frictions (Ddiba et al., 2020; Fobbe & Hilletofth, 2023; She et al., 2025). For scholars, the model specifies testable propositions on the mediation of

CE adoption and moderating effects of governance strength and policy stringency, offering construct definitions and indicators for empirical work (Esposito et al., 2024; Palafox-Alcantar et al., 2021; Kunal et al., 2025). In conclusion, by integrating Stakeholder, Institutional, and NRBV/Dynamic Capability lenses within the CE paradigm, the framework clarifies the mechanism engagement → adoption → outcomes, aligns with current evidence, and provides a pragmatic pathway for accelerating waste reduction in high- and low-regulation contexts.

Proposition Development

Proposition 1: Stakeholder Engagement and CE Adoption

Stakeholder engagement conceived as the breadth, depth, and quality of participation by salient actors such as regulators, suppliers, communities, customers, and employees consistently emerges as a precursor to circular economy (CE) adoption because it provides legitimacy, shared problem-solving, and resource/knowledge access that lower implementation frictions and translate intentions into routinized circular practices (e.g., design for disassembly, take-back systems, source separation, industrial symbiosis). Empirical and sectoral evidence shows that cooperation/readiness among municipal and market actors is a necessary condition for CE transitions (Palafox-Alcantar et al., 2021); early and continuous engagement aligns incentives and enables circular material value chains in complex projects (She et al., 2025); governance mechanisms (board oversight, CSR, disclosure) institutionalize engagement and move firms from compliance to commitment, deepening CE initiatives (Al-Najjar et al., 2025); and clear communication with partners and employees strengthens internalization of CE routines in manufacturing and supply chains (Kunal et al., 2025; Fobbe & Hilletofth, 2023). At the system level, policy coherence and cross-level collaboration increase the capacity to adopt resource-recovery solutions (Ddiba et al., 2020), while even in highly regulated domains such as healthcare, engagement is identified as a thematic driver of circular transformation despite operational constraints (Saha et al., 2025). Moreover, engagement can amplify the performance case around CE, reinforcing organizational commitment to adopt and sustain circular practices (Esposito et al., 2024).
Proposition 1: Stakeholder engagement positively affects CE adoption

Proposition 2: CE Adoption and Waste Reduction

Circular economy (CE) adoption as a mediator converts the intentions of stakeholders into routinized approaches, i.e. separation of sources and contamination control, deposit-return and take-back schemes, repair/reuse hubs, industrial symbiosis and optimized portfolios of recycling and thermal recovery, which reduces waste to landfill and maximizes secondary-material benefits (Negrete-Cardoso et al., 2022). Systematic adoption of CE increases the diversion rates and stabilizes the resource recovery performance when integrated into the municipal operations (Bertanza et al., 2021) and supported by the urban CE programs organizing the collaboration of actors (Salles et al., 2024) based on longitudinal and city-scale evidence.

Interventions in developing-city contexts further indicate that adoption of CE practices (e.g., organics valorization, low-carbon treatment) can cut emissions and improve recovery, provided enabling capacities are present (Ddiba et al., 2020), while sectoral studies highlight technology and process redesign (e.g., waste-to-chemicals) as adoption pathways that convert residuals into value streams (Iaquaniello et al., 2018). Policy-led experiments also associate CE adoption with higher innovation and performance, strengthening the plausibility that adoption is the proximate driver of waste outcomes.
Proposition 2: CE Adoption positively affects waste reduction.

Proposition 3: Stakeholder Engagement and Waste Reduction

Stakeholder engagement exerts a direct influence on waste outcomes by mobilizing citizen participation in source separation, building social acceptance for reuse/repair, and coordinating multi-actor actions that reduce contamination and increase secondary-material yield; empirical and sectoral evidence shows that cooperation and readiness among municipal actors and communities close the persistent intent–action gap in diversion programs (Palafox-Alcantar et al., 2021), that policy coherence and cross-level collaboration strengthen cities' capacity to implement resource-oriented systems (Ddiba et al., 2020), and that early, continuous engagement in complex projects (e.g., construction and demolition) enables circular material value chains that cut waste at source (She et al., 2025). Within firms and supply chains, transparent communication and "circular stakeholder engagement practices" (co-creation with suppliers/customers, take-back

agreements) align behaviors that raise return flows and recovery rates (Fobbe & Hilletofth, 2023; Kunal et al., 2025), while urban CE initiatives relying on multi-stakeholder orchestration (industrial symbiosis, reuse markets) document improvements in diversion and recovery performance (Salles et al., 2024). Even in highly regulated domains such as healthcare, reviews identify engagement as a thematic driver for transitioning practices toward circularity, suggesting spillovers to waste prevention and recovery despite operational constraints (Saha et al., 2025). Further, engagement strengthens the business case around circular activities, supporting continuity and scale that are prerequisites for sustained waste outcomes (Esposito et al., 2024).
Proposition 3: Stakeholder engagement positively affects waste reduction

Proposition 4: The Mediating Role of CE Adoption between Stakeholder Engagement and Waste Reduction
Stakeholder engagement provides legitimacy, shared problem-solving, and resource/knowledge access that motivate and enable organizations and municipalities to adopt circular practices (e.g., design for disassembly, take-back, source separation, industrial symbiosis), thereby converting diffuse intentions into routinized operational change (Fobbe & Hilletofth, 2023; Kunal et al., 2025; Palafox-Alcantar et al., 2021; She et al., 2025). Once adopted, circular economy (CE) practices function as the proximate drivers of waste outcomes by reducing contamination, increasing secondary-material yields, and stabilizing diversion effects documented in long-run municipal trajectories, European portfolio analyses of recycling–thermal synergies, and developing-city interventions that link CE adoption to measurable recovery and emissions benefits (Bertanza et al., 2021). System-level governance capacity and policy coherence strengthen this chain by lowering coordination costs and raising implementation capability (Ddiba et al., 2020), while policy experiments show that CE-oriented mandates spur green innovation and an adoption pathway closely tied to improved environmental performance. Moreover, engagement often reinforces the business case around circular activities, supporting continuity and scale that are prerequisites for sustained waste outcomes (Esposito et al., 2024).
Proposition 4: Circular economy adoption mediates the positive relationship between stakeholder engagement and waste reduction

5. Conclusion

This study advances a coherent explanation of how stakeholder engagement propels circular economy (CE) adoption and, through that adoption, improves waste reduction. Synthesizing diverse sectoral evidence, we found that engagement, defined by its breadth, depth, and quality, acts on two pathways: a direct route that mobilizes participation in source separation, reuse, and take-back behavior; and an indirect, mediated route in which engagement enables CE adoption as routinized operational change. Across contexts, programs that combine early and continuous engagement, clear role alignment, and multi-actor coordination report higher diversion, lower contamination, and stronger secondary-material yields. The review also highlights boundary conditions, governance capacity, policy coherence, and digital readiness that shape how effectively engagement translates into measurable waste outcomes.

Theoretically, the paper integrates Stakeholder Theory, Institutional Theory, and the Natural Resource–Based View with Dynamic Capabilities into a single framework that clarifies the mechanism engagement → CE adoption → waste reduction, while allowing for a direct engagement → outcomes link. This integration contributes testable propositions on mediation, specifies construct domains (engagement breadth/depth/quality, CE adoption depth/scope/routinization, diversion and recovery metrics), and surfaces a capability-building lens for understanding how organizations reconfigure processes under circular logics. By articulating boundary conditions, the framework also reconciles mixed findings in the literature and offers a portable structure for comparative analyses across sectors and city types.

Practically, the framework functions as a diagnostic and design tool. Municipal leaders and firms can map stakeholder salience, upgrade engagement from consultation to co-creation, and institute governance infrastructures—board oversight, transparent disclosure, cross-sector platforms that stabilize collaboration over time. Priorities for investment include source-separation quality programs, circular procurement, repair/reuse hubs, industrial symbiosis facilitation, and digital enablers such as tracking and feedback systems. Program managers should pair engagement strategies with clear operational targets (diversion rates,

contamination thresholds, recovery yields), run iterative improvement cycles, and structure incentive and policy mixes that lower coordination costs and scale successful circular practices.

The study's limitations include reliance on a narrative review, dependence on a single indexing database, English-language bias, and heterogeneous measures that constrain meta-analytic inference and causal attribution. Future research should deploy multi-level and longitudinal designs to test the proposed mediation and moderators; pair surveys with administrative waste data for stronger measurement; and exploit quasi-experiments or field trials around policy shocks, deposit-return schemes, and engagement platform rollouts. Promising directions include necessary-condition and configurational analyses, cross-regional panel studies, mixed-methods evaluations of equity and inclusion in engagement processes, and integration of life-cycle assessment with econometric models to capture rebound effects and net environmental gains.

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