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FACTORS ASSOCIATED WITH THE ECONOMIC VIABILITY OF ZERO-WASTE BUSINESS MODELS AMONG NEW MARKET ENTRANTS IN EMERGING ECONOMIES: A CONCEPTUAL INTEGRATIVE REVIEW

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Abstract

This conceptual-integrative review examines the conditions associated with the economic viability of zero-waste business models launched by new market entrants in emerging economies. The paper distinguishes zero-waste business models from the broader circular economy and defines economic viability as continuity-adjusted commercial performance: the capacity to generate a positive yield-adjusted contribution, cover operating cash needs, retain paying demand, and move towards survival or replication while retaining material value. A purposive synthesis of peer-reviewed studies and authoritative institutional sources published between 2021 and 2026 was organised by geography, sector, method, theory, explanatory mechanism, and outcome measure. The synthesis develops a multilevel set of firm, transaction, ecosystem, institutional, and digital antecedent domains. The central contribution is a context-sensitive framework showing that emerging-economy conditions are not merely a descriptive label: institutional voids, informal material markets, infrastructure gaps, and uneven enforcement alter the cost, reliability, and legitimacy through which these domains become commercially relevant. The paper develops nine association-based propositions and an operationalisation blueprint for future empirical studies. Because the evidence is heterogeneous and the review does not estimate effect sizes, the framework supports theory building and measurement development rather than causal claims.

Keywords: Zero-waste business models, Economic viability, Circular economy, New market entrants, Emerging economies, Sustainable entrepreneurship, Circular business models

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1. Introduction

Rapid urbanisation, industrialisation, and consumption are increasing waste volumes while leaving significant material value outside formal recovery systems. The resulting gap has created opportunities for new ventures that prevent waste, extend product life, recover materials, valorise organic residues, or coordinate exchanges between suppliers and users. These ventures may contribute to resource efficiency and inclusive industrial development, but their environmental purpose does not by itself establish a commercially durable business. The Global Waste Management Outlook emphasises both the resource potential of waste and the importance of a just transition for workers whose livelihoods are connected to recovery activities (United Nations Environment Programme [UNEP], 2024).

The commercial challenge is the conversion of a circular or zero-waste proposition into recurring value for a paying customer or sponsor. Recovered inputs must be available at the required quality, time, and delivered cost; reused products must meet buyer expectations; and the venture must finance collection, processing, certification, and delivery before receipts arrive. Recent reviews identify demand uncertainty, limited finance, weak capabilities, supply-chain coordination, and institutional barriers as recurring constraints on circular-business implementation (Assmann et al., 2023; Geissdoerfer et al., 2023; Hina et al., 2022; Mishra et al., 2022; Van Opstal & Borms, 2023; Virmani et al., 2022). Financial performance is also addressed inconsistently across the literature, with adoption and environmental performance often receiving more attention than cash generation, operating continuity, or replication (Esposito et al., 2024; Kanzari et al., 2022).

These issues are particularly important for new market entrants. Unlike established firms, early-stage ventures usually have limited legitimacy, customer history, supplier depth, installed assets, and financial buffers. Circular start-ups therefore need to assemble resources and relationships while testing both market demand and material flows. Their operating conditions are also shaped by the institutional and infrastructural features of emerging economies, including uneven enforcement, unreliable power and transport, limited testing capacity, high financing costs, and the importance of informal collectors and traders. These conditions can increase transaction costs, but they can also create local knowledge, flexible labour, dense networks, and opportunities for frugal innovation (Awana et al., 2024; Cantú et al., 2021; Malik et al., 2022).

The existing literature provides valuable accounts of circular-business drivers and barriers, yet three analytical gaps remain. First, many studies examine circular adoption, intention, or sustainable performance without treating economic viability as a clearly specified outcome. Second, studies of established SMEs and successful cases provide limited guidance on the resource and cash constraints faced by new entrants. Third, firm-level, supply-chain, ecosystem, and institutional factors are frequently discussed separately, even though a venture can benefit from one condition only when other conditions allow it to operate. For example, digital matching has limited value when material movements cannot be completed, and low-cost feedstock has limited value when contamination, transport, or weak demand erodes its margin.

This article asks: which firm-level, transaction-level, ecosystem-level, and institutional conditions are associated with the economic viability of zero-waste business models launched by new market entrants in emerging-economy contexts, and through what mechanisms and boundary conditions? The paper makes four contributions. It defines economic viability as a continuity-adjusted commercial outcome rather than a single-period profit or environmental claim; it establishes a clear boundary between zero-waste business models and the broader circular economy; it integrates nine antecedent domains across resource, transaction, institutional, and ecosystem levels; and it shows how institutional voids, informal-sector interaction, infrastructure gaps,

venture age, and zero-waste archetype modify the relevance of those domains. The article is a conceptual-integrative review, not an empirical study, and its propositions are intended for future testing with objective and longitudinal evidence.

2. Conceptual Boundaries and Definitions

2.1 Zero-waste business models

A zero-waste business model is a system for creating, delivering, and capturing value in which waste prevention, value retention, or productive use of unavoidable residues is central to the commercial proposition. It is narrower than the circular economy, which covers a wider set of regenerative and resource-retaining activities across an economic system. A zero-waste business model is therefore treated in this article as a venture-level operating orientation within the wider circular economy, not as a synonym for every circular practice.

Four overlapping archetypes are relevant. Prevention and redesign models reduce material use or replace disposable products with services. Reuse, refill, repair, and refurbishment models extend the useful life of products or packaging. Recovery and valorisation models convert separated materials or organic residues into inputs, products, energy, or services. Industrial-symbiosis and digital-coordination models connect residual flows between firms or organise collection, exchange, and verification. A venture may combine more than one archetype, but its inclusion in this framework requires that retained material value be part of its value proposition and operating logic.

The boundary excludes an isolated recycling activity with no identifiable business model, a corporate social-responsibility project that lacks a continuing value-capture logic, and a digitally branded venture whose principal activity remains linear. Absolute zero waste is not assumed. The relevant test is whether the venture can document a material or product flow, show how value is retained or disposal is avoided, and connect that activity to revenue, savings, cost avoidance, or another payer benefit. This boundary is consistent with recent work that treats zero waste as a prevention, separation, recovery, and stakeholder-coordination system rather than only an end-of-pipe treatment technology (Almansour et al., 2024).

2.2 Economic viability as the primary outcome

Economic viability is the primary dependent construct in this framework. It refers to continuity-adjusted commercial performance: the capacity of a new venture to produce value at an acceptable risk, cover its operating cash requirements, maintain paying demand, and move towards survival or replication without undermining the material-value and environmental boundary of the zero-waste model. A single accounting-profit observation is insufficient because a venture may report sales while losing money on each recovered unit, or may record a temporary loss while its unit economics, utilisation, and financing path are improving.

For future empirical testing, the primary observable financial indicator is yield-adjusted contribution, defined as the realised revenue from the recovered, reused, repaired, or otherwise retained-value output after variable collection, sorting, processing, quality-control, reverse-logistics, delivery, and residue-disposal costs.

Yield-adjusted contribution = (realised revenue - variable recovery and delivery costs) / realised revenue

Operating-cash coverage, recurring or renewed demand, break-even progress, survival, and capacity for responsible replication are secondary validation indicators. Environmental performance is a boundary condition rather than a substitute for commercial viability; diversion or circularity without a defensible

financial path does not establish viability. The review therefore does not construct or estimate a composite viability index. If future researchers create one, the components should be specified as a formative index, the weights should be justified, and convergent, discriminant, and predictive validity should be reported.

Viability is inherently time-dependent. The measure proposed above captures performance during a defined observation period, whereas durable viability requires evidence across operating cycles. A cross-sectional measure can describe the venture's current commercial position and its expected continuity, but it cannot establish long-term survival, causal direction, or the effect of later changes in prices, infrastructure, technology, regulation, or financing. This temporal boundary is a central limitation of the evidence base and is addressed explicitly in the research agenda and limitations sections.

2.3 New market entrants

A new market entrant is a venture in its first five years of commercial operation or a new business unit introducing a product or service for which it has limited routines, customer history, legitimacy, and supply-chain depth in the focal market. The five-year boundary is an analytical rule for identifying liability of newness, not a claim that all ventures mature at the same rate. A mature firm conducting a small circular experiment within an established system is outside the focal category unless the new unit operates with a distinct resource, customer, and supply-chain base.

2.4 Emerging-economy context as an explanatory condition

Emerging economies are not treated as a single country sample or as a uniform category. In this review, the term refers to market and institutional environments characterised by rapid change, uneven infrastructure, incomplete or inconsistent formal institutions, and overlapping formal and informal economic activity. The evidence is cross-context: it includes studies and reports concerning Africa and Nigeria, India, Vietnam, Mexico, Europe as a developed-economy comparator, and other developing-market settings. The article does not pool country effects or claim that every emerging economy has the same set of associated conditions.

The emerging-economy context is explanatory because it changes the mechanisms through which venture conditions become commercially relevant. Institutional voids can make permits, standards, enforcement, and contracting less predictable. Informal-sector interaction can provide access to routes, suppliers, labour, and local knowledge while also raising challenges relating to safety, standardisation, traceability, bargaining power, and fair value distribution. Infrastructure gaps can raise the cost of electricity, transport, testing, storage, connectivity, and payment. These conditions alter the level and variability of transaction costs, the reliability of material and revenue flows, and the legitimacy required for a young venture to secure customers and finance (Cantú et al., 2021; Ezeudu, 2024; Oyinlola et al., 2022; Zuofa et al., 2023).

2.5 Analytical roles and measurement logic

The framework has one primary dependent construct, economic viability, and nine distinct antecedent domains that function as the conceptual independent variables. New-entrant status defines the focal venture stage, while the emerging-economy conditions, zero-waste archetype, and venture age operate as boundary conditions. The nine antecedent domains are not reflective indicators of a single latent factor representing viability. Each domain represents a distinct mechanism and should be measured separately.

Economic viability is specified as a multidimensional formative outcome because contribution, liquidity, revenue durability, survival, and replication add different information to the construct and are not interchangeable symptoms of one underlying trait. Within each antecedent domain, future researchers should

decide whether indicators are reflective or formative from the domain's conceptual definition and empirical behaviour. This article provides a measurement blueprint but reports no empirical scale validation or effect estimate.

Economic viability = f(nine antecedent domains | venture age, zero-waste archetype, and emerging-economy conditions)

Table 1: Core constructs and analytical distinctions

Construct	Role in framework	Working definition	Operational boundary and indicators
Zero-waste business model	Unit of analysis and inclusion condition	A venture-level value-creation, delivery, and capture system that makes prevention, reuse, repair, recovery, or productive use of residues central to its commercial proposition.	Excludes an isolated recycling task or unsupported environmental claim. Indicators include material retained, avoided disposal, recovery yield, repeated use, and attributable revenue or savings.
Economic viability	Primary dependent outcome	Continuity-adjusted commercial performance: positive yield-adjusted contribution, operating-cash capacity, paying demand, and credible progress towards survival or replication.	Primary indicator: yield-adjusted contribution. Validation indicators: cash coverage, recurring revenue, break-even progress, survival, utilisation, and responsible replication. Environmental benefit alone is insufficient.
Nine antecedent domains	Conceptual independent variables	Distinct firm, transaction, ecosystem, institutional, and digital conditions that provide mechanisms through which a zero-waste model may become commercially viable.	The domains are not reflective indicators of one latent factor. Each is measured with domain-specific indicators and expected association with viability.
New market entrant	Venture-stage boundary condition	A venture in its first five years of commercial operation or a new unit with limited routines, legitimacy, customer history, and supply-chain depth in the focal market.	Years trading, first paid sale, customer and supplier history, installed capacity, and distinctness from the parent firm's established system.
Emerging-economy context	Contextual boundary condition and possible moderator	A rapidly changing market and institutional environment with uneven infrastructure, incomplete or inconsistent formal institutions, and interaction between formal and informal systems.	Country or region is not used as a uniform proxy. Indicators include enforcement predictability, service reliability, financing cost, infrastructure access, informal-sector participation, and network depth.

Source: Author's synthesis of the conceptual and empirical literature cited in the article.

3. Theoretical Foundation

No single theory fully explains the viability of a new zero-waste venture because the commercial outcome depends simultaneously on internal capabilities, transaction arrangements, institutions, and ecosystem relationships. The framework therefore uses four complementary lenses. The resource-based and dynamic-capability perspectives explain how firms assemble and renew capabilities; transaction-cost economics explains the costs of sourcing, contracting, verification, and coordination; institutional theory explains legitimacy, enforcement, and institutional voids; and the entrepreneurial-ecosystem perspective explains how external actors supply resources and market access. The lenses are complementary rather than competing explanations.

3.1 Resource-based view and dynamic capabilities

The resource-based view treats valuable, rare, difficult-to-imitate, and organised resources as sources of performance differences between firms (Barney, 1991). In a zero-waste venture, relevant resources include material-flow knowledge, process routines, quality-control capability, customer insight, credible impact records, and the ability to learn from pilots. Dynamic capabilities extend this logic by focusing on how the venture senses opportunities, chooses a value-capture model, and reconfigures processes and partnerships as conditions change. Evidence on absorptive capacity, organisational factors, and circular start-up barriers supports the relevance of learning, managerial commitment, external knowledge, and adaptive routines (Awana et al., 2024; Chowdhury et al., 2022; Marrucci et al., 2022).

3.2 Transaction-cost economics

Transaction-cost economics directs attention to the difference between the technical value of a residue and its delivered economic value. A venture may incur costs to locate suppliers, verify material, negotiate access, coordinate collection, manage quality, store inputs, settle payments, and enforce agreements. These costs are especially relevant where ownership, specifications, prices, and delivery responsibilities are uncertain. Contracts, aggregation centres, information sharing, and digital records can reduce some costs, but only when physical networks fulfil the transactions they represent. This lens therefore connects feedstock security, unit economics, reverse logistics, and digital traceability to the viability outcome (Kamal et al., 2022; Oyinlola et al., 2022; Williamson, 1985).

3.3 Institutional theory and institutional voids

Institutional theory explains how regulative, normative, and cultural-cognitive conditions shape what organisations can do and how credible they appear to stakeholders (Scott, 2014). For a new zero-waste venture, permits, standards, extended producer responsibility, procurement rules, classifications, enforcement, and social acceptance affect both the expected revenue and the cost of compliance. Institutional voids do not simply mean the absence of rules; they also include weak intermediaries, inconsistent enforcement, limited information, and unreliable contract support. Evidence from Nigeria and developing-market SMEs shows why policy clarity, standards, leadership, and coordinated implementation matter for circular-business activity (Ezeudu, 2024; Pacheco et al., 2024; Zuofa et al., 2023).

3.4 Entrepreneurial-ecosystem perspective

An entrepreneurial-ecosystem perspective locates venture performance in the interaction of entrepreneurs, customers, suppliers, financiers, public agencies, intermediaries, infrastructure providers, and knowledge institutions. Circular ventures depend on this wider system because they rarely own every collection route,

processing asset, testing facility, certification capability, or market channel required for a material loop. Ecosystem relationships can supply resources and legitimacy, but dependency and bargaining asymmetry can also concentrate control and transfer risk to the entrant. Recent circular-economy studies describe the movement from individual business models to business ecosystems and highlight the interacting firm, network, and institutional levels (Ferreira et al., 2024; Kanda et al., 2021; Stam & van de Ven, 2021).

3.5 Integrated theoretical argument

Together, the four lenses produce a multilevel explanation. Internal capability influences whether the venture can design and adapt a viable model; transaction governance influences whether materials and services move at an acceptable cost; institutions influence legitimacy, relative prices, and uncertainty; and the ecosystem influences access to assets, knowledge, finance, and markets. Emerging-economy conditions connect these levels by changing the reliability and cost of each mechanism. The framework therefore expects conditional associations rather than a universal ranking of factors. A domain may be commercially valuable in one archetype or country while remaining weak, costly, or unavailable in another.

Table 2: Literature mapping and analytical positioning

Mapping dimension	Pattern in the reviewed literature	Limitation for the viability question	Position in this framework
Geography	Evidence spans Europe as a comparator and emerging/developing settings in Africa, Nigeria, India, Vietnam, Mexico, and other markets (Cantú et al., 2021; Dey et al., 2022; Despoudi et al., 2023; Ezeudu, 2024; Mathivathanan et al., 2022; Oyinlola et al., 2022).	Country and region are often treated as background rather than as mechanisms, and the evidence is not a pooled cross-country estimate.	Emerging economy is modelled through institutional, informal-sector, infrastructure, and financing conditions rather than as a uniform country label.
Industry and sector	Studies cover manufacturing SMEs, food, plastics, product returns, repair-related activity, start-ups, and broad circular-business transitions (Chowdhury et al., 2022; Han et al., 2023; Kamal et al., 2022; Oyinlola et al., 2022).	Sector differences affect material density, quality, route economics, certification, and customer payment, yet they are often aggregated.	The framework uses zero-waste archetype and material characteristics as boundary conditions for the salience of each domain.
Method	The source base includes systematic and structured reviews, surveys, qualitative studies, exploratory studies, and institutional reports (Assmann et al., 2023; Kraus et al., 2022; Mishra et al., 2022).	Different methods use different outcomes and levels of analysis, which prevents a defensible pooled effect estimate.	A conceptual-integrative synthesis is used to compare mechanisms and develop testable operational definitions, not to calculate a meta-analytic effect.

Theoretical lens	Recent work draws on resource and capability, institutional, supply-chain, finance, and ecosystem ideas, but the lenses are frequently applied in isolation (Geissdoerfer et al., 2023; Hina et al., 2022; Malik et al., 2022).	A separated treatment obscures how internal resources, transaction arrangements, institutions, and networks combine in a young venture.	Four complementary lenses are integrated to connect venture, transaction, institutional, and ecosystem mechanisms.
Outcome focus	Adoption, circular practices, barriers, sustainable performance, scaling, and selected financial outcomes are common outcomes; viability is explicit in only part of the literature (Bocken et al., 2022; Esposito et al., 2024; Han et al., 2023; Kanzari et al., 2022).	Adoption or environmental activity does not establish yield-adjusted contribution, liquidity, continuity, or responsible replication.	Economic viability is the primary formative outcome, with clear financial, demand, continuity, and replication indicators.

***Source**: Author's mapping of the reviewed literature. The cited studies are used as contextual and theoretical evidence, not as a pooled dataset.*

4. Methodological Approach

4.1 Design and philosophical justification

The article uses a conceptual-integrative literature review with a pragmatic and realist-informed orientation. The pragmatic element follows the problem: the article seeks a usable explanation of the conditions associated with economic viability. The realist-informed element recognises that material flows, costs, contracts, cash receipts, and operating continuity are real commercial phenomena, while their expression depends on context and the meanings attached to circular activity. This design fits the question because the available evidence is heterogeneous and includes cases, surveys, reviews, policy studies, and technology research that do not share a single dependent measure. The purpose is to compare mechanisms, identify boundary conditions, and translate recurring explanations into constructs and propositions.

The article is not a qualitative field study and does not claim to be a statistical meta-analysis. It has no firm-level sample, questionnaire, interview protocol, regression output, or estimated effect size. Its unit of analysis is the published study or authoritative report, while the proposed future unit of analysis is the new zero-waste venture or business unit. Treating the paper as a conceptual review makes the design transparent and avoids presenting a literature-derived framework as empirical evidence.

4.2 Scope and search strategy

The evidence window covers publications dated 2021 to 2026, chosen to capture recent developments in circular start-ups, finance, policy, digital systems, and waste-value chains. The source pool was assembled through targeted searches using four groups of terms. Circularity terms included zero waste, circular business model, waste-to-value, reuse, repair, and resource recovery. Venture terms included start-up, new entrant, SME, emerging economy, and developing economy. Outcome terms included viability, profit, finance, performance, scaling, drivers, and barriers. Context terms included supply chain, informal sector, infrastructure, policy, technology, and digitalisation.

A source was retained when it addressed at least one of the following: value creation or value capture, material or product flows, financial or operating performance, venture capabilities, ecosystem relationships, institutional conditions, or mechanisms relevant to young circular firms. Peer-reviewed scholarship and authoritative institutional reporting were eligible when they contained a clear business-model dimension. Developed-economy studies were retained as comparators where they clarified general circular-business mechanisms, but the framework's explanatory emphasis remains on emerging and developing-market conditions.

The search was purposive rather than exhaustive. The review does not report screening totals, a PRISMA flow, bibliometric counts, or a pooled effect because those records were not established in the source work. This limitation is disclosed rather than replaced with invented screening statistics. The approach follows guidance that a literature review can function as an independent study when its boundaries, synthesis logic, and contribution are made explicit (Kraus et al., 2022).

4.3 Inclusion and exclusion criteria

The inclusion frame required a source to address a circular, zero-waste, reuse, repair, recovery, waste-valorisation, or related business model and to provide evidence about an economic, organisational, supply, financial, institutional, digital, or ecosystem condition. Priority was given to sources that examined start-ups, new entrants, SMEs, or early commercialisation. Sources were excluded when they focused only on technical treatment efficiency, household behaviour without a business-model dimension, environmental life-cycle performance without commercial evidence, or generic policy description without a mechanism relevant to venture viability.

4.4 Data extraction and synthesis procedure

For each retained source, the synthesis considered the geographical setting, sector, venture maturity, unit of analysis, method, theoretical lens, antecedent condition, proposed mechanism, outcome measure, and boundary condition. The evidence was first classified into venture, transaction, ecosystem, and institutional levels. Related conditions were then grouped into nine domains. In the final step, each domain was specified in terms of its mechanism, candidate indicators, interaction with other domains, and relevance to emerging-economy conditions.

The synthesis moved from descriptive barriers to association-based propositions. For example, a source describing unreliable feedstock was not treated as proof that feedstock causes viability; it was interpreted as evidence for a mechanism that may influence utilisation, yield, delivery reliability, and cash performance. This distinction is important because the source base is cross-sectional, multi-method, and contextually diverse.

4.5 Proposed empirical design and analytical technique

Future empirical work should combine a structured venture survey with documentary and operational evidence. A survey or interview protocol can measure market validation, finance-model fit, managerial capability, ecosystem relationships, institutional predictability, and digital integration. Invoices, contracts, bank records, weighbridge or batch records, maintenance logs, and customer-retention data should be used to measure yield-adjusted contribution, cash coverage, material quality, and fulfilled transactions. Subjective viability ratings may supplement these measures but should not replace objective indicators where records are available.

For a cross-sectional predictive study, hierarchical regression or PLS-SEM may test associations between the nine domains and the formative viability outcome when the sample size, measurement quality, and assumptions are adequate. PLS-SEM is suitable when the aim is prediction with multidimensional composites; covariance-

based SEM is appropriate only where reflective measurement and distributional assumptions are theoretically justified. A longitudinal panel or survival model is preferable for testing continuity, time to break-even, or venture exit. Fuzzy-set qualitative comparative analysis can complement these approaches by identifying alternative combinations of conditions that produce viable outcomes.

5. Antecedent Domains Associated with Economic Viability

The nine domains below are literature-derived antecedent conditions, not statistically confirmed causes. Each domain describes a mechanism through which a new zero-waste venture may convert material value into commercial value. The domains are interdependent: demand without feedstock, feedstock without yield, technology without maintenance, or finance without an appropriate cash cycle may provide limited viability.

5.1 Market acceptance and problem-solution fit

A zero-waste venture requires a defined problem for which a customer, municipality, producer, investor, or other payer receives a measurable benefit. The benefit may be lower total cost, reliable access, compliance, convenience, quality, design, reduced disposal exposure, or credible environmental performance. Stated environmental preference is weaker evidence than realised purchase, renewal, repeat order, contracted offtake, realised price, or customer-acquisition payback. Circular-business research similarly distinguishes the desirability of a proposition from its feasibility and viability (Bocken et al., 2022; Hina et al., 2022).

Emerging-economy demand may be shaped by affordability, supply reliability, local service access, and institutional procurement. A venture should therefore identify who receives the benefit and who pays for it. If reuse lowers a municipality's disposal cost while creating limited private utility for households, a producer, municipality, or service contract may be a more credible payer than a consumer premium. Scaling research also shows why repeat demand and a credible route to market matter when start-ups move beyond pilot activity (Han et al., 2023).

5.2 Value-capture architecture and unit economics

Value capture concerns how retained material value becomes revenue, savings, cost avoidance, or usable cash. Possible arrangements include product sales, collection fees, subscriptions, leasing, repair fees, brokerage, producer-responsibility contracts, verified information services, and shared savings. Multiple revenue streams may reduce dependence on one customer, but they can also increase billing, service, governance, and coordination complexity. The appropriate architecture depends on asset life, ownership, customer behaviour, risk allocation, and the timing of payment.

Unit economics should include the costs that are easy to overlook in circular systems: failed collection, contamination, moisture or weight loss, sorting labour, testing, rejected batches, reverse transport, downtime, customer education, and disposal of non-conforming residues. A nominally free input can therefore generate a negative contribution at the factory gate. Financial-performance reviews emphasise the importance of linking circular activity to contribution, cash, and the cost of the operating cycle rather than relying on sales growth alone (Esposito et al., 2024; Kanzari et al., 2022).

5.3 Feedstock security and material quality

A zero-waste venture operates in both a customer market and a material-supply market. Feedstock security refers to the availability of the required input in sufficient volume, at the required time and specification, within a commercially feasible collection radius and price range. Agricultural residues can be seasonal; plastics and

metals can respond to commodity prices; moisture and contamination can reduce yield; and competition among collectors can redirect valuable streams. Feedstock is therefore a portfolio of relationships and specifications rather than a material waiting to be collected.

Reliability can be improved through multiple suppliers, separation-at-source training, quality-based payment, planned routes, longer-term agreements, and pre-processing near the source. Excessive exclusivity can create dependence on one supplier or anchor client. Information sharing and return coordination can improve the visibility of flows, but the commercial result depends on whether the promised material is delivered at the required quality (Assmann et al., 2023; Kamal et al., 2022; Mathivathanan et al., 2022).

5.4 Context-appropriate operations, technology, and scalable capacity

Appropriate technology is technology that performs under the venture's actual operating conditions, not simply equipment with the highest rated throughput. Relevant conditions include batch size, input variability, power quality, water access, operator skill, maintenance support, spare parts, safety, emissions, and buyer specifications. Equipment designed for clean and stable industrial feedstock may produce low yields when supplied with mixed local material. Automation can add fixed cost without removing the need for collection and sorting. The relevant comparison is dependable output per usable unit over the equipment's life cycle.

Capacity should grow with proven demand and operating learning. Modular lines, equipment leasing, shared processing, contract manufacturing, local repair, preventive maintenance, cross-trained staff, and mobile pre-processing can reduce premature fixed investment. Evidence from emerging-market SMEs and developing-economy transitions highlights the importance of matching standards, process design, and resource constraints to the conditions in which the venture actually operates (Despoudi et al., 2023; Pacheco et al., 2024).

5.5 Finance-model fit

The relevant financing question is not only how much capital is raised but whether its duration, repayment profile, security requirements, and risk tolerance fit the business model. Zero-waste ventures may experience slow cash recovery, uncertain markets, equipment requirements, inventory exposure, and costs for testing or certification. Used products, future material flows, operating data, and take-back agreements may be difficult for conventional lenders to value. Short-maturity debt can therefore impose risk on a model whose assets or customer relationships mature slowly.

Different stages may require different instruments. Small grants or concessional finance can support technical proof, market creation, and safer worker integration. Working-capital facilities can support contracted receivables and inventory; leasing can finance modular equipment; revenue-based finance can fit predictable recurring sales; and patient equity can absorb market-building and technical uncertainty. Better operational information and ecosystem participation can improve fundability by making material, asset, and cash-flow risks more visible (de la Cuesta-González & Morales-García, 2022; Fallahi et al., 2023).

5.6 Entrepreneurial, managerial, and absorptive capability

Circular founders must understand material properties, process controls, stakeholder incentives, customer needs, and the commercial consequences of recovery losses. Environmental purpose can help attract employees, partners, and legitimacy, but it must be connected to evidence-based adaptation. A viable venture preserves its material and environmental boundary while testing different streams, prices, services, and partner roles.

Absorptive capability is particularly important because a young firm cannot possess all the knowledge it needs. It must recognise valuable external knowledge, assimilate it, apply it through repeatable routines, and transfer it when people or partners change. Leadership, training, measurement, experimentation, cross-functional coordination, documented procedures, batch histories, and cost dashboards can turn pilot experience into organisational memory (Chowdhury et al., 2022; Marrucci et al., 2022).

5.7 Ecosystem collaboration and inclusive reverse logistics

Collection, pre-processing, certification, manufacturing, distribution, and end-of-life recovery frequently involve several organisations. Anchor customers, shared assets, existing routes, testing facilities, and intermediaries can reduce capital requirements and coordination costs. Partnerships can also create dependence, delayed payment, information asymmetry, bargaining pressure, or transfer of compliance liability to the new entrant. Viability therefore depends on clear responsibilities, data rights, cost allocation, recovered-value sharing, and risk sharing.

Informal waste workers are a central part of this domain rather than a peripheral social consideration. They may provide route knowledge, aggregation capacity, flexible collection, and access to material that formal systems cannot reach. Excluding them can create supply disruption, conflict, and loss of local knowledge; integrating them without safety, fair compensation, quality standards, and bargaining protection can shift health and social costs onto vulnerable suppliers. An inclusive reverse-logistics arrangement should document transactions, provide appropriate equipment and training, use transparent quality incentives and digital or auditable payment, and recognise informal actors as economic partners. Circular business ecosystems and global waste-policy discussions both support this inclusion as part of commercial and social durability (Ferreira et al., 2024; Kanda et al., 2021; UNEP, 2024).

5.8 Institutional predictability and infrastructure

Institutions influence both the revenue opportunity and the cost of operating. Extended producer responsibility, green procurement, landfill charges, standards, classifications, permits, trade rules, and taxes can change the relative position of recovered and virgin inputs. The commercial value of formal provisions depends on consistent implementation. Abrupt policy changes, arbitrary classifications, weak enforcement, and fragmented agency responsibilities can discourage investment and create risks for compliant entrants. Evidence from Nigeria indicates that regulatory clarity and coordinated implementation are important for circular-business activity (Ezeudu, 2024; Zuofa et al., 2023).

Infrastructure is part of the business model's cost structure. Unreliable electricity can damage equipment and reduce utilisation; weak transport increases collection costs; limited testing capacity can delay certification; inadequate storage can increase contamination; and weak connectivity or payment systems can increase leakage and reconciliation costs. Emerging-economy conditions therefore operate as a contextual amplifier or constraint: they can change the strength of the relationship between internal capability, material access, and economic viability.

5.9 Digital traceability, data, and platform economics

Digital tools become economically relevant when they reduce uncertainty or coordination cost per completed transaction. They can identify suppliers, schedule collection, record weight and origin, match by-products with users, support payment, document quality, and make operating performance more auditable to customers and financiers. Research on African plastic value chains, emerging-market waste entrepreneurship, and Industry

4.0 applications shows how digitalisation can support coordination and resource efficiency (Despoudi et al., 2023; Mondal et al., 2023; Oyinlola et al., 2022).

Digital activity has limited commercial value when it is disconnected from physical fulfilment. A platform requires usable devices, connectivity, trustworthy data, accessible interfaces for informal suppliers, and a physical network capable of completing the matched transaction. The appropriate indicators are fulfilled transactions, verified material volume, route productivity, reductions in search or reconciliation cost, and improved payment or quality records, not the number of listings or users alone.

Table 3: Nine antecedent domains, mechanisms, indicators, and analytical roles

Construct and role	Candidate indicators	Recommended data sources	Analytical treatment
Economic viability (primary dependent outcome)	Yield-adjusted contribution; operating-cash coverage; recurring revenue or renewal; break-even progress; survival; responsible replication.	Financial accounts; invoices; bank activity; cash records; venture cohorts; founder records.	Formative outcome. Yield-adjusted contribution is the primary observable financial indicator; time period must be stated.
Market acceptance and payer benefit (IV1)	Realised price; repeat purchase; renewal; contracted offtake; conversion; customer-acquisition payback.	Invoices; contracts; customer systems; buyer surveys; procurement records.	Distinct antecedent. Use realised behaviour as the preferred evidence over intention alone.
Value capture and unit economics (IV2)	Revenue durability; contribution after recovery losses; cost per completed unit; cash-conversion cycle; recurring share.	Cost records; invoices; production and logistics records; cash-flow model.	Distinct antecedent. Assess revenue logic and cost structure together.
Feedstock security and quality (IV3)	Contracted proportion; volume variation; contamination; specification compliance; recovery yield; supplier concentration.	Weighbridge or batch records; supplier agreements; collection logs; quality reports.	Distinct antecedent. Test concentration and seasonality as possible boundary conditions.
Operations and technology (IV4)	Utilisation; uptime; energy and water use; downtime; maintenance; defects; rejection rate; modularity.	Production records; maintenance files; technical assessment; utility records.	Distinct antecedent. Compare performance with actual local operating conditions.
Finance-model fit (IV5)	Funding maturity; repayment flexibility; working-capital cover; debt-service coverage; milestone alignment.	Financing contracts; cash-flow model; lender or investor records.	Distinct antecedent. Examine fit between finance terms and operating cycle.

Construct and role	Candidate indicators	Recommended data sources	Analytical treatment
Managerial and absorptive capability (IV6)	Experiment cadence; documented procedures; training; use of outside knowledge; data completeness; review routines.	Management and employee surveys; operating manuals; pilot records; document review.	Distinct antecedent. Determine reflective or formative measurement from theory and pilot evidence.
Ecosystem and informal-sector integration (IV7)	Anchor contracts; partner continuity; payment time; risk and value sharing; safety; quality training; inclusion of informal workers.	Agreements; network surveys; stakeholder interviews; payment and safety records.	Distinct antecedent. Model partnership dependence and fair inclusion as boundary conditions.
Institutions and infrastructure (IV8)	Permit predictability; enforcement consistency; compliance expense; power, transport, testing, storage, and payment reliability.	Policy coding; manager surveys; permits; infrastructure statistics; operating records.	Contextual antecedent and possible moderator. Avoid using country identity as the sole measure.
Digital traceability (IV9)	Verified movements; fulfilled transactions; route gains; complete records; lower fraud and reconciliation cost.	Platform logs matched with physical records; payment data; route and quality records.	Distinct antecedent. Digital activity must be linked to physical completion and cost reduction.

***Source**: Author's operationalisation blueprint. No composite score or empirical effect is estimated in this conceptual review.*

6. Heterogeneity across Zero-Waste Archetypes and Markets

The relevance of each antecedent domain depends on the zero-waste archetype, material characteristics, customer type, and venture stage. Waste-to-product manufacturing is especially sensitive to feedstock specification, recovery yield, energy cost, certification, and equipment utilisation. Repair and refurbishment depend more heavily on skill, parts availability, warranties, quality trust, and customer retention. Refill and reuse models depend on route density, container return, hygiene, cleaning cost, and convenience. Digital exchanges require two-sided participation and reliable physical fulfilment, while biological-residue ventures face seasonality, perishability, odour, land, and storage constraints.

Customer type also changes the operating and cash profile. Business buyers may provide volume and offtake but can demand certification, exert bargaining power, and delay payment. Consumer models may offer faster payment but require customer acquisition, education, convenience, and recovery participation. Public buyers may provide scale and legitimacy while introducing procurement and payment delays. New entrants should therefore begin with a beachhead market whose transaction pattern matches their operating capacity and cash cycle before diversifying.

Material density further affects viability. High-value, low-volume materials such as components, electronics, and metals can support wider inspection and reverse-logistics radii. Bulky, low-value materials generally require dense routes, local processing, tipping income, policy-supported demand, or shared infrastructure. Perishable organics require even tighter collection and processing coordination. These differences explain why the framework is conditional and why future studies should report venture age, material type, archetype, customer class, and country-level institutional conditions rather than treating all circular ventures as one population.

7. Implications for Entrepreneurs, Investors, and Ecosystem Actors

7.1 Implications for entrepreneurs and venture-support programmes

The first validation task is to identify a problem for which someone will pay and a material or product flow that can be accessed, measured, and delivered. A pilot should track the path from source to paid outcome, including weight, contamination, labour time, transport distance, energy use, recovery loss, rejected output, payment time, repeat purchase, and customer retention. A combined cost, material, and impact record can support pricing, process improvement, fundraising, and credible environmental reporting.

Expansion should be governed by evidence rather than by the visibility of waste or the availability of a grant. Repeat orders, stable quality and yield, a positive contribution cushion, trained operators, maintenance capacity, working capital, and clear responsibility for payment should support the next stage. Leasing, outsourcing, shared logistics, and contract processing can preserve flexibility while uncertainty is high. Where informal workers are part of the material system, the venture should build transparent quality and payment arrangements that improve safety, dignity, traceability, and continuity.

7.2 Implications for investors and lenders

Due diligence should examine both the enterprise and the material loop. In addition to margin, cash runway, customer concentration, governance, and management, investors should verify that feedstock is legally and commercially available, quality is connected to recovery yield, reverse-logistics responsibilities are clear, and output meets buyer specifications. Environmental claims should be supported by material-balance boundaries and credible life-cycle reasoning. A temporary regulatory advantage or grant should be distinguished from a durable value-capture mechanism.

Risk-based financing can sequence capital according to venture maturity. Technical proof, early market creation, and safer informal-sector integration may require catalytic or concessional support, while repeatable equipment and contracted receivables may suit commercial credit. Milestone-based disbursement can use customer commitments, yield, utilisation, fulfilled transactions, and cash-conversion performance. Such arrangements align finance with the mechanisms specified in this framework (Fallahi et al., 2023; Kanzari et al., 2022).

8. Policy Implications for Emerging Economies

Policy should reduce system-wide cost and uncertainty rather than rely only on repeated grants to individual start-ups. Consistent separation at source, interoperable records, testing capacity, product and material standards, predictable extended producer-responsibility rules, and procurement based on life-cycle performance can improve the conditions under which new entrants compete with virgin inputs and disposal practices. The objective is to make credible circular performance bankable and commercially visible.

Public support should be sequenced to venture needs. Small grants can validate a process or service; guarantees and working-capital facilities can support contracted demand; shared infrastructure can prevent duplication of expensive assets; and outcome-based contracts can reward verified service quality, recovery, or diversion. Support should be linked to unit economics, worker protection, material-balance evidence, and utilisation rather than installed capacity alone.

Informal workers should be treated as economic partners in the transition. Registration or cooperative arrangements, safety equipment, fair quality-based payment, digital or auditable identity, training, and accessible dispute resolution can improve recovery, traceability, and income. Abrupt exclusion can remove local collection capacity and weaken livelihoods. A just transition therefore supports both social legitimacy and the reliability of the material system (UNEP, 2024).

Policy should be stable enough for investment and flexible enough for learning. Regulatory sandboxes, transition schedules, phased standards, coordinated agency action, and transparent enforcement can allow innovation while protecting workers and the environment. The relevant policy test is whether public action lowers the coordination, compliance, infrastructure, and risk costs that otherwise prevent a viable zero-waste model from operating.

9. Research Agenda

Future research should move from intention to actual commercial performance. Pilot-to-commercial studies can distinguish temporary learning and financing constraints from persistent non-viability. Panel data should measure yield-adjusted contribution, cash coverage, customer retention, material quality, utilisation, and financing changes across operating periods. Survival models can examine time to exit or continuity, while country-level institutional measures can be used to represent enforcement, infrastructure, finance, and informal-sector conditions directly.

Measurement development should begin with qualitative interviews or cognitive testing involving founders, workers, customers, financiers, and policymakers. A pilot instrument can then be assessed for content validity and reliability before the nine antecedent domains are tested. Because economic viability is formative, researchers should not assume that all indicators are interchangeable or average them without a theoretical and statistical justification.

More than one configuration may produce viability. Fuzzy-set qualitative comparative analysis can identify alternative pathways, such as low capital intensity combined with local partnerships and labour-rich operations, or higher capital intensity combined with patient finance and anchor contracts. Regression or SEM can test direct and interaction associations, while matched cases can explain how policy implementation and informal-sector integration produce different outcomes. Multi-country studies should model country conditions directly rather than use a broad emerging-economy label as a proxy.

Financial and environmental measures should be integrated without collapsing them into one outcome. Financial statements and cash records should be analysed alongside material circulation, recovery yield, recycled content, diversion, and tests of rebound or burden shifting. Commercial success may coexist with increased total consumption or the transfer of environmental and social burdens elsewhere. Distributional, gender, and age effects should also be tracked because financial viability can be achieved through arrangements that leave informal workers, women, or young people with less value and protection.

10. Limitations

This article is a conceptual-integrative review and does not make causal inferences. The purposive 2021-2026 evidence window improves recency but is not an exhaustive search and may underrepresent foundational, unsuccessful, informal, or unpublished work. The source base is heterogeneous by geography, sector, method, venture maturity, and outcome measure; formal manufacturing SMEs are more visible than early-stage, hybrid, and informal ventures. Publication and survivorship bias may also make successful circular innovations easier to observe than failed or discontinued ones.

The proposed indicators and formative outcome logic require empirical validation. In particular, the cross-sectional viability measures used in parts of the underlying literature capture a current position rather than durable performance over time. Changes in infrastructure, policy, technology, commodity prices, customer demand, or financing can change a venture's commercial position. The framework should therefore be interpreted as a theory-building and measurement-development contribution, not as evidence that any single domain causes viability in every emerging economy or zero-waste archetype.

11. Conclusion

This article positions economic viability as the primary commercial outcome for new zero-waste ventures and identifies nine distinct antecedent domains associated with that outcome. The venture must connect a paying problem to a credible value-capture model, specification-compliant feedstock, context-appropriate operations, finance that fits the cash cycle, organisational learning, trusted ecosystem relationships, predictable institutions and infrastructure, and digital records that correspond to completed physical transactions.

The central theoretical contribution is that emerging-economy conditions are explanatory mechanisms rather than a descriptive label. Institutional voids, informal-sector interaction, infrastructure gaps, and uneven enforcement change the cost, reliability, bargaining, and legitimacy through which the nine domains become commercially relevant. The framework does not claim a universal ranking or causal estimate. It provides a clear outcome definition, a literature-mapped set of antecedent constructs, association-based propositions, and an empirical measurement path for research that can test when zero-waste ventures move from pilot activity towards resilient and inclusive commercial operation.

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