

Integrating ESG Reporting and Circular Economy Principles: A Conceptual Framework for Sustainable Transformation in the Indian Automotive Industry

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ABSTRACT

The transition to a Circular Economy (CE) is increasingly important for resource-intensive industries such as the automotive sector, particularly in emerging economies facing rapid industrialisation, resource pressures, and evolving sustainability regulations. This conceptual paper examines how Environmental, Social, and Governance (ESG) reporting can enable CE implementation in the Indian automotive industry. Although ESG reporting and CE have emerged as prominent sustainability approaches, organisations and research often treat them as separate domains. To address this gap, the study adopts a conceptual research design, supported by an integrative literature review, to develop an ESG–CE Integration Framework (ESG–CEIF). Drawing on Stakeholder Theory (ST), Institutional Theory (IT), and the Natural Resource-Based View (NRBV), the framework explains how external sustainability pressures can be translated, through ESG governance and reporting mechanisms, into organisational capacities and operational circularity. The framework proposes five interconnected dimensions: external sustainability drivers, ESG governance and reporting mechanisms,

organisational enabling capacities, CE operational practices, and sustainable performance outcomes. Organisational enabling capacities are positioned as key transmission mechanisms linking reporting and implementation. The framework further incorporates a feedback mechanism through which sustainable performance outcomes inform subsequent ESG measurement, materiality assessment, target setting, and organisational learning. The paper contributes by repositioning ESG reporting from a predominantly disclosure-oriented activity to a potential organisational infrastructure for circular transformation. It provides a theoretically grounded basis for future empirical validation. It offers practical implications for automotive manufacturers, policymakers, regulators, suppliers, investors, and other stakeholders seeking to advance sustainable transformation within the Indian automotive industry.

Keywords: Environmental, Social and Governance (ESG) Reporting; Circular Economy (CE); Indian Automotive Industry; Integration Framework; Sustainable Transformation

INTRODUCTION

Climate change, resource scarcity, biodiversity loss, and rising stakeholder expectations are increasingly challenging the viability of the traditional linear “take-make-dispose” model [1]. Resource-intensive industries face growing pressure to reduce reliance on virgin materials, minimise waste, and improve transparency on sustainability performance. The CE offers an alternative by seeking to retain the value of products, components, and materials through reduction, reuse, repair, refurbishment, remanufacturing, recycling, and recovery [2]. At the same time, ESG reporting has become an important mechanism for measuring, governing, and communicating sustainability impacts, risks, and performance [3]. CE therefore provides an operational logic for resource transformation, while ESG reporting provides the information that can support such change.

The automotive industry is particularly exposed to these pressures because it relies on extensive flows of steel, aluminium, copper, and other critical minerals [4]. Its global, multi-tier supply chains combine energy-intensive manufacturing with long product lifecycles [5]. Electrification can reduce tailpipe emissions, but it also heightens the importance of mineral sourcing [6]. Sustainable transformation therefore requires more than replacing internal-combustion vehicles with electric vehicles. It requires changes to product design, sourcing, manufacturing, use, maintenance, reverse logistics, remanufacturing, and end-of-life recovery [4].

These challenges are particularly significant in India, one of the world’s largest and fastest-growing automotive markets [7]. The sector contributes substantially to economic growth and employment, but expansion also intensifies resource consumption, emissions, water use, waste generation, and pressures from end-of-life vehicles [7-9]. India’s shift towards electric mobility further heightens the strategic importance of batteries and

critical materials. Policies such as the Vehicle Scrappage Policy, Battery Waste Management Rules, Extended Producer Responsibility mechanisms, and electric-mobility programmes signal a growing institutional commitment to more sustainable automotive systems [10,11,13]. However, implementation remains constrained by technological, financial, informational, organisational, infrastructural, and supply-chain barriers [5].

India’s ESG reporting environment has developed rapidly through the Securities and Exchange Board of India’s (SEBI) Business Responsibility and Sustainability Report (BRSR) [14]. BRSR requires major listed companies to disclose structured information across environmental, social, and governance dimensions [14]. At the same time, BRSR Core introduces a subset of key performance indicators [15]. For automotive firms, these requirements heighten focus on emissions, energy, water, waste, value-chain responsibilities, and governance. Yet ESG reporting may remain retrospective and compliance-oriented [16]. Consequently, circularity can be reduced to reporting on recycling, reuse, recovery, and waste disposal rather than being integrated into design, procurement, investment, and operational decision-making.

CE can support India’s automotive transition by reducing dependence on virgin materials, extending product and component lifespans. Relevant applications include resource-efficient and modular design, remanufacturing, parts reuse, battery second-life applications, reverse logistics, and higher-quality recycling [4]. Nevertheless, implementation requires coordinated action across multiple stakeholders. It also depends on reliable material-flow information, infrastructure, technology and expertise [17]. CE implementation is therefore not only a technical issue but also a management, governance, and coordination challenge.

ESG reporting and CE have evolved as parallel responses to sustainability

pressures, yet largely within separate research and organisational domains [17]. ESG has primarily been associated with disclosure, corporate governance, investor decision-making, risk management, and accountability [3]. CE has focused more strongly on material flows, industrial ecology, eco-design, remanufacturing, reverse logistics, and circular business models [17]. A similar separation can occur within firms, with ESG managed by sustainability, finance, or governance functions, while circularity remains concentrated in engineering, operations, or supply-chain departments [17]. This separation risks limiting the potential synergies between the two approaches.

The central research gap concerns explaining how ESG reporting can actively enable CE implementation rather than merely documenting sustainability performance after the event. Reporting alone does not make an organisation circular. However, when ESG processes are linked to materiality assessment, target setting, governance responsibilities, investment decisions, supplier requirements, monitoring, and assurance, they may shape the organisational conditions necessary for circular transformation. ESG reporting can make resource dependencies and sustainability risks visible, translate them into measurable priorities, assign accountability, and support value-chain coordination. Accordingly, this paper proposes that ESG reporting enables CE implementation when reporting-related information and governance mechanisms develop organisational capacities that translate external sustainability pressures into changes in products, processes and material flows. This leads to the guiding research question:

How can ESG reporting enable CE implementation in the Indian automotive industry?

To address this question, the paper develops an ESG-CEIF framework tailored to the Indian automotive context. The framework

conceptualises ESG reporting not only as a disclosure mechanism but also as a potential management infrastructure for CE implementation. It links sustainability measurement and materiality to strategic prioritisation, governance, accountability, resource allocation and value-chain coordination. These processes can support circular interventions across design, sourcing, manufacturing, product use, reverse logistics, remanufacturing, and end-of-life recovery. The relationship is also potentially reinforcing: ESG reporting can support circular implementation, while circular improvements can strengthen sustainability performance, which is subsequently captured through ESG reporting.

This paper contributes by integrating ESG reporting and CE implementation within a single conceptual framework. First, it moves beyond a disclosure-centric view of ESG by positioning reporting as a potential organisational enabler of transformation. Second, it broadens CE beyond environmental resource efficiency by incorporating the social and governance dimensions of responsible sourcing, stakeholder accountability, and value-chain oversight. Third, it situates the relationship within India's automotive, regulatory, and supply-chain environment. The proposed framework therefore offers a basis for future empirical research and a structured perspective for automotive managers, policymakers, regulators, investors, and other stakeholders seeking to connect ESG governance with substantive circular transformation.

Theoretical Background

Integrating ESG reporting with CE principles helps explain how sustainability disclosure can support operational transformation. ESG reporting identifies, measures, manages, and communicates sustainability impacts, risks, targets, and performance, whereas CE focuses on reducing dependence on virgin resources, retaining value, extending product lifetimes,

and slowing or closing resource loops [17]. Their integration is complementary: ESG reporting creates information, and accountability structures, while CE provides operational strategies to improve resource-related sustainability performance.

This relationship is not automatic. Reporting can remain symbolic if disclosure increases without corresponding changes in resource use, products, or processes [16]. Likewise, CE may be reduced to recycling, overlooking higher-value strategies such as repair, reuse, refurbishment, and remanufacturing [2]. The central question is therefore how ESG reporting can enable substantive circular implementation.

ESG reporting encompasses organisational processes for measuring and communicating material environmental, social, and governance issues [2]. Its environmental dimension covers emissions, energy, materials, waste, pollution, and resource dependencies [3]. The social dimension addresses employees, labour conditions, communities, and supply-chain impacts, while governance concerns responsibility, policies, and internal controls [3]. Its significance extends beyond transparency. Materiality assessments identify priorities; indicators make performance visible; targets set expectations; and governance structures assign responsibility [18]. When linked to procurement, product development, and strategic planning, reporting can influence organisational behaviour. This is particularly relevant to CE, as circular transformation depends on information about recycled content, product longevity, recovery and value-chain dependencies [17].

For the purpose of this paper, ESG reporting is understood not merely as the external publication of sustainability information, but as the organisational reporting infrastructure through which material ESG matters are identified, measured, governed, monitored, verified and communicated. Disclosure represents the visible output of this process, whereas the underlying

reporting infrastructure can influence organisational decision-making.

For conceptual clarity, this paper distinguishes ESG disclosure, ESG reporting processes and ESG governance. ESG disclosure refers to the external communication of sustainability information [3,16]. ESG reporting processes encompass the identification, measurement, monitoring, verification and communication of material ESG information [3,18]. ESG governance refers to the organisational responsibilities, accountability structures and decision-making arrangements through which such information is acted upon [18]. ESG-CEIF does not assume that disclosure alone generates circular transformation [16,17]. Rather, it proposes that ESG reporting becomes enabling when reporting processes are embedded within governance and operational decision-making systems [17,18].

CE seeks to replace the linear “take–make–dispose” model with systems that reduce resource extraction and preserve the economic and functional value of products, components, and materials [1]. Although no universally accepted definition exists, CE generally emphasises reduced virgin-material usage, waste prevention and value retention [2]. Circular strategies vary in value. Recycling is important but often occurs after much embedded value has been lost [2]. Other strategies include reducing material requirements and extending product life, as well as repairing, reusing, refurbishing, and remanufacturing [2]. In automotive systems, CE therefore spans design, material selection, manufacturing, maintenance, recovery, remanufacturing, and end-of-life treatment [4].

This paper adopts ST, IT, and NRBV. ST holds that firms create sustainable value by considering groups that affect or are affected by organisational activities, including investors, employees, customers, suppliers, regulators, and communities [19]. IT explains how organisations respond to regulatory, normative, and social pressures by adopting recognised practices to gain

legitimacy and conformity [20]. These pressures may be coercive, normative, or mimetic [20]. NRBV extends the Resource-Based View by recognising environmental knowledge, technologies, routines, and capabilities as potential sources of competitive advantage [21]. It emphasises pollution prevention, resource efficiency, and sustainable innovation [21].

In ST, ESG reporting provides a structured framework through which organisations identify stakeholder concerns and communicate sustainability risks, targets, and performance [18]. CE requires collaboration among suppliers, manufacturers, customers, recyclers, waste processors, and policymakers. Stakeholders can influence demand for repairability, recycled materials, responsible sourcing, and end-of-life responsibility [22]. In IT, reporting requirements, investor expectations, professional standards, and industry benchmarks create pressure for transparency on sustainability. In India, SEBI's BRSR framework is an important institutional mechanism that embeds ESG measurement and disclosure within organisational routines [14]. CE is similarly influenced by environmental regulation, waste-management requirements, and industry norms [5]. In the NRBV, ESG reporting can strengthen environmental capabilities by making material dependencies, waste, and risks visible. Targets, monitoring, and governance provide a basis for learning and for resource allocation [18]. CE operationalises many NRBV principles through resource reduction, reuse, remanufacturing, reverse logistics, and closed-loop systems. These capabilities can reduce resource dependence and supply-chain risks.

In ST, the Indian automotive industry has a complex stakeholder network spanning manufacturers, suppliers, investors, regulators, consumers, communities, recyclers, and scrap operators. ESG reporting can help align these actors by formalising expectations on materials, resource efficiency, and end-of-life

accountability. In IT, Indian automotive firms face simultaneous pressures from BRSR requirements, Extended Producer Responsibility regulations, the National Automobile Scrappage Policy, emissions standards, investors, and industry associations [5,10,11,14]. ESG reporting can translate these pressures into internal indicators, governance arrangements, and routines that support CE implementation. From an NRBV perspective, capabilities in component remanufacturing, closed-loop recycling, resource efficient design and reverse logistics can be strategically valuable for Indian automotive firms. ESG reporting can support their development of these capabilities by identifying where circular capabilities are needed and by monitoring measurable improvements.

The three theories together explain how ESG reporting can enable CE implementation. ST identifies sustainability expectations, IT explains the pressures that institutionalise them, and NRBV explains how firms transform them into capabilities and strategic value. ESG reporting connects these dimensions through materiality assessment, governance, value-chain disclosure, and accountability. In this sequence, ESG reporting acts as the organisational translation mechanism through which stakeholder and institutional pressures are converted into measurable priorities, responsibilities and information that can support the development of NRBV-related organisational capabilities.

The ESG-CEIF therefore distinguishes between disclosure and implementation. Reporting becomes an enabler only when it influences decisions, resource allocation, product design, and material flows. ESG reporting is thus conceptualised as an intermediary governance and information infrastructure that connects external sustainability expectations with internal circular capabilities and operational transformation in the Indian automotive industry. Table 1 maps the three theoretical perspectives onto the principal dimensions

and explanatory mechanisms of the ESG- CEIF.

Table 1 - Theory to Framework Mapping

Theoretical Perspective	Principle Explanatory Role	Main ESG-CEIF Dimensions
Stakeholder Theory	Explains sustainability expectations, accountability demands and stakeholder pressures	Dimensions 1 and 2
Institutional Theory	Explains regulatory, normative and industry pressures and their institutionalisation through governance and reporting routines	Dimensions 1 and 2
Natural Resource-Based View	Explains development and deployment of environmental capabilities and their contribution to circular practices and strategic value	Dimensions 3, 4 and 5
Integrated Theoretical Logic	Explains how external sustainability expectations are translated through ESG mechanisms into organisational capacities, CE practices and sustainable performance	Entire ESG-CEIF

METHODOLOGY

This study adopts a conceptual research design to examine how ESG reporting can enable the implementation of the CE in the Indian automotive industry. A concept paper methodology is appropriate when the aim is to clarify constructs, connect fragmented research streams and develop new theoretical relationships [23]. ESG reporting and CE research have evolved in parallel and a conceptual approach enables these fields to be integrated into a coherent explanatory model [23]. The conceptual design is supported by an integrative literature review. This approach is suitable because the research question spans several disciplines [24]. It enables concepts to be compared, gaps to be identified, and insights to be synthesised. The review is interpretive, and it is not presented as an exhaustive systematic review or meta-analysis. Its purpose is to select literature that contributes directly to understanding the relationship between ESG reporting, organisational behaviour and CE implementation.

The principal objective is to answer: How can ESG reporting enable the implementation of the CE in the Indian automotive industry?

A framework is justified because the relevant relationships are dispersed across multiple literatures. This methodology is appropriate because the research question is exploratory and theory-building [23]. It seeks to explain underdeveloped

relationships rather than to test an established model. The focal unit of analysis is the automotive firm, particularly vehicle manufacturers and major component producers operating within the Indian automotive value chain. Suppliers, dealers, recyclers, regulators and other actors are treated as external or value-chain actors that influence firm-level ESG reporting and CE implementation.

Literature was identified through structured searches of Scopus, Web of Science, and Google Scholar.

The literature search was conducted during May and September of 2026. Because the objective was conceptual integration rather than exhaustive evidence aggregation, publications were selected for their theoretical relevance, contextual applicability and capacity to explain relationships among ESG reporting, organisational mechanisms and CE implementation. The search covered ESG and sustainability reporting, CE theory and implementation, and the Indian automotive context. Priority was given to literature published between 2015 and 2026. Keywords included “ESG,” “ESG reporting,” “sustainability reporting,” “BRSR,” “Circular Economy,” “automotive industry,” and “India.” Searches combined terms using “AND” and “OR” as Boolean operators. A representative search combination was: (“ESG reporting” OR “sustainability reporting” OR “BRSR”) AND (“Circular Economy” OR

“remanufacturing” OR “reverse logistics”) AND (“automotive” OR “vehicle”) AND “India”. The included publications examined ESG or sustainability reporting, CE principles, the manufacturing or automotive industries, sustainability governance, supply chains, organisational capabilities, or transferable theoretical insights. Excluded publications focused solely on financial ESG ratings, treated CE solely as a technical engineering issue, lacked sufficient academic or institutional credibility, duplicated findings, or addressed unrelated sectors without transferable relevance.

The synthesis comprised four stages: concept identification, theoretical integration, relationship mapping and framework development. First, concept identification was used to identify recurring themes across the selected literature, including stakeholder pressures, governance, materiality, transparency, assurance, resource efficiency, eco-design, remanufacturing, traceability, supplier collaborations and organisational learning. These concepts provided the initial building blocks for the framework. Second, theoretical integration organised the identified concepts through ST, IT and NRBV. ST was used to interpret stakeholder expectations and accountability demands, IT to explain regulatory and normative pressures, and NRBV to explain the development of organisational capabilities supporting circular implementation. Third, relationship mapping examined how ESG reporting functions could address recognised CE barriers and support

operational practices. For example, materiality assessment was linked to strategic prioritisation, value-chain disclosure to supply-chain transparency, performance indicators to resource-flow measurement, and governance mechanisms to organisational accountability. Fourth, framework development integrated the resulting relationships into five interconnected dimensions: external sustainability drivers, ESG governance and reporting mechanisms, organisational enabling capacities, CE operational practices and sustainable performance outcomes. A feedback relationship was incorporated to reflect how sustainable performance outcomes could inform subsequent ESG measurement, materiality assessment, target setting and organisational learning.

These five dimensions form the basis of the ESG-CEIF developed in the literature synthesis and framework sections. The methodology relies on researcher judgement because the review is conceptual and integrative rather than exhaustive. The proposed relationships are not empirically tested and require validation through case studies, surveys, comparative research and longitudinal analysis. The framework is also specific to the Indian automotive context, which may limit direct generalisation. Ongoing changes in reporting standards, regulation and automotive technologies may require refinement. Literature was progressively screened for conceptual relevance and theoretical transferability.

Figure 1 illustrates the four-stage literature synthesis process leading to the ESG-CEIF.

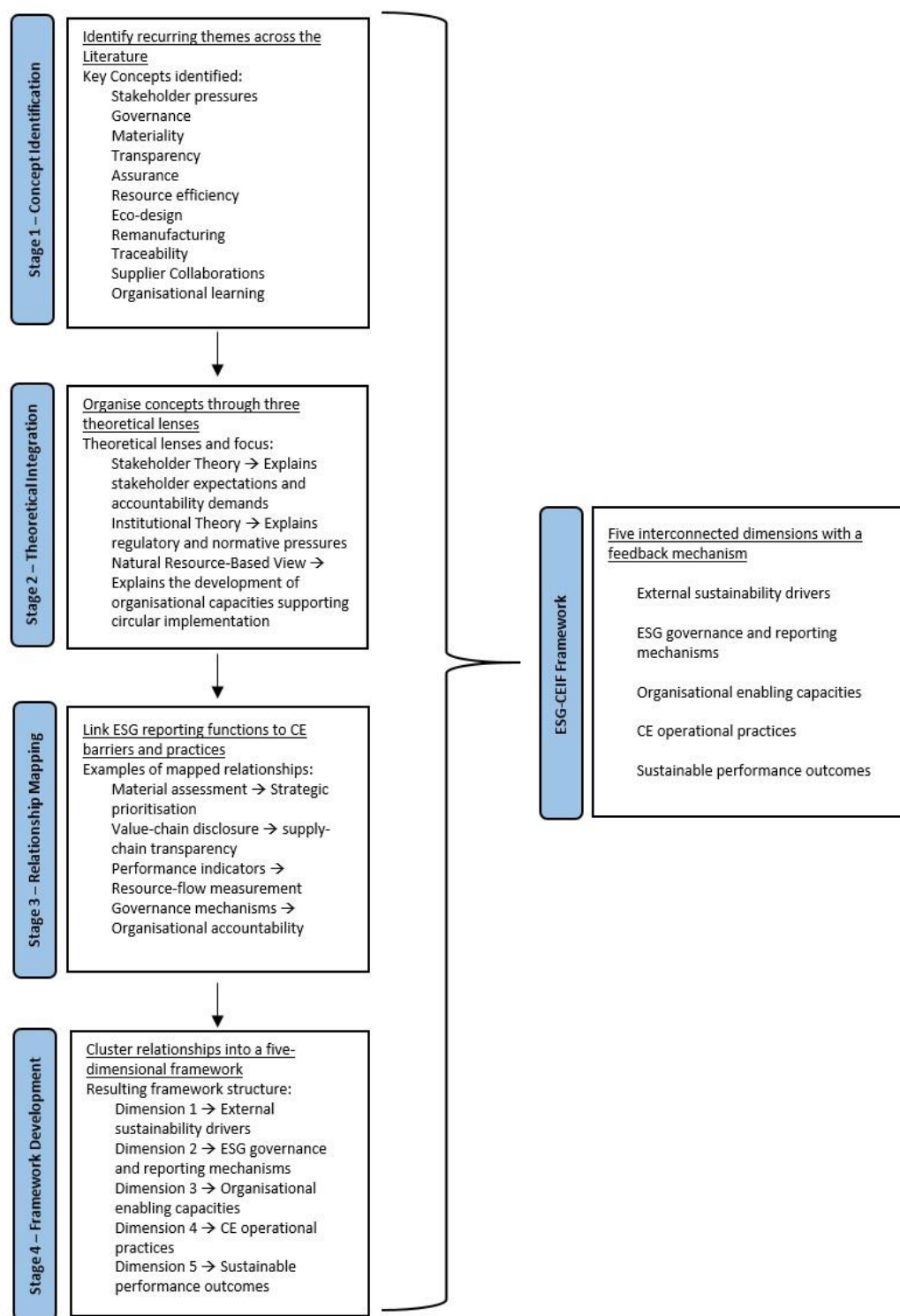


Figure 1 - Four-stage Literature Synthesis

LITERATURE SYNTHESIS

ESG Reporting in India

ESG reporting has evolved from voluntary corporate social responsibility (CSR) disclosures into a structured mechanism for evaluating and communicating

organisational sustainability performance [3]. Earlier disclosures mainly addressed philanthropy, community initiatives and environmental compliance [25]. They were often presented in standalone reports, used inconsistent indicators and remained largely

disconnected from financial and operational decision-making. The Triple Bottom Line broadened the understanding of corporate performance by incorporating environmental, social and economic value [26]. This perspective encouraged organisations to examine how their activities affect natural resources, employees and other stakeholders. It also contributed to the transition from traditional CSR reporting towards ESG reporting, in which sustainability concerns are increasingly integrated into risk management, corporate governance and long-term value creation [3].

The development of recognised reporting frameworks has improved the structure, consistency and comparability of sustainability information [27]. The Global Reporting Initiative (GRI) provides specific standards relevant to circularity, including materials and waste [28,29]. More recent sustainability frameworks have further strengthened the relationship between non-financial information, corporate governance and financial reporting [3]. This development has shifted the purpose of sustainability reporting. ESG reporting increasingly requires organisations to identify material sustainability issues, assign responsibilities and monitor performance against targets [18]. Reporting can therefore support organisational learning by enabling companies to recognise weaknesses, identify emerging risks, evaluate operational improvements and compare performance across facilities and suppliers [18]. ESG reporting is increasingly evolving from an external communication activity into an internal management system. However, this potential depends on whether reporting processes are integrated into core organisational functions rather than being confined to sustainability or compliance departments.

India's sustainability-reporting environment has developed considerably with the introduction of the BRSR by SEBI. The BRSR is aligned with the National Guidelines on Responsible Business

Conduct and requires major listed companies to disclose information on environmental performance, employee welfare, human rights, responsible sourcing, stakeholder engagement and governance [14]. In the automotive industry, BRSR Principles 2 and 6 are particularly relevant. Principle 2 concerns the sustainable and safe provision of goods and services, including responsible sourcing and consideration of product life cycles [14]. Principle 6 addresses the protection and restoration of the environment, covering energy consumption, greenhouse-gas emissions, water use, waste management and resource efficiency [14]. BRSR Core further strengthens this reporting architecture by using key performance indicators organised around nine ESG attributes [15]. One attribute, "circularity," covers waste categories, waste intensity, recycling, reuse, other recovery methods and disposal [15]. These indicators provide a useful regulatory foundation, although they remain primarily waste-oriented and give less attention to circular inputs, repairability, remanufacturing and battery second-life applications. India's value-chain reporting requirements have also continued to evolve. Although value-chain ESG disclosures became voluntary for the relevant covered entities from the 2025–26 financial year, they remain strategically important [30]. Many automotive sustainability impacts and circular opportunities arise outside manufacturers' direct operations, particularly among suppliers, dealers, repair networks and recyclers.

The purpose of ESG reporting has shifted from documenting corporate responsibility initiatives to influencing organisational behaviour and stakeholder relationships. Investors use ESG information to assess exposure to climate, regulatory and supply-chain risks [31]. Customers increasingly expect responsible sourcing and measurable environmental performance [5]. Regulators require greater transparency, while business partners and international markets may demand evidence of compliance with

sustainability expectations [5]. Reporting can reduce information asymmetry by making corporate performance more visible and comparable. It can also expose inconsistencies between public commitments and actual performance, thereby increasing pressure for stronger accountability [16,32]. In manufacturing, ESG information is increasingly linked to operational resilience, corporate reputation and long-term competitiveness [31]. The growing importance of stakeholders means that reporting cannot be treated solely as a communication exercise.

Despite regulatory progress, ESG reporting in India faces several barriers. Many companies continue to view reporting primarily as a compliance requirement [33]. Information may be compiled retrospectively by sustainability, legal or investor-relations departments after operational decisions have already been made [16]. This limits its ability to influence vehicle design, procurement, manufacturing or end-of-life planning. Data fragmentation is another major challenge. Automotive manufacturers operate through extensive multi-tier value chains [5]. Suppliers, dealers, service providers and recyclers may use incompatible information systems and reporting boundaries [34]. As a result, manufacturers may lack reliable information on material origin, waste flows and end-of-life recovery. Other limitations include inconsistent indicators, weak comparability, insufficient assurance, and the risk of greenwashing [16,27,35]. Companies may report isolated circular initiatives, such as water recycling or factory-waste recovery, without demonstrating how these activities contribute to broader product and material circularity. Waste-focused reporting may also present an incomplete picture if it does not consider virgin-material consumption, product durability, or the quality of recovered resources [17].

When integrating into managerial processes, ESG reporting can create an organisational information architecture linking sustainability measurement with investment,

innovation and operational improvement [18]. Accountability can be strengthened through board oversight, management responsibilities and performance evaluations, particularly when ESG indicators enter product-development reviews, manufacturing dashboards and executive incentives [36]. Its transformative value therefore depends on whether credible ESG information influences operational decisions rather than remaining confined to external publications.

CE in India

The CE developed from concepts such as industrial ecology, cradle-to-cradle design and performance-based business models [1]. It challenges the linear take–make–dispose model by seeking to retain the value of products, components and materials through reduction, reuse, repair, refurbishment, remanufacturing and recycling [2]. In manufacturing, CE aims to reduce reliance on virgin resources while minimising waste and environmental impacts [1]. It extends beyond recycling to include product design, procurement, production, distribution, maintenance, reverse logistics and end-of-life recovery [4]. The automotive industry is particularly well suited to CE because vehicles contain valuable, recoverable materials and long-lived assets [4]. Opportunities for circularity exist throughout the vehicle life cycle, from material selection and modular design to maintenance, remanufacturing, dismantling and high-quality recovery [4].

India has introduced several initiatives to support automotive circularity. The Vehicle Scrappage Policy and the Voluntary Vehicle Fleet Modernisation Programme aim to remove unfit and highly polluting vehicles while developing a more formal end-of-life vehicle system [10]. Registered Vehicle Scrapping Facilities and automated testing arrangements are intended to strengthen vehicle assessment, collection, dismantling and material recovery [10]. Extended Producer Responsibility regulations affect automotive manufacturers by imposing

requirements on batteries, tyres and electronic waste [11-13]. These regulations increase producers' responsibility for collection, recycling and safe end-of-life management [11-13]. The interaction between BRSR reporting, EPR regulations and vehicle scrappage policies creates an institutional link between disclosure and circular operations. Reporting generates demand for sustainability information, while operational policies require companies to develop collection, traceability and recovery systems.

CE implementation remains constrained by technological, organisational and institutional barriers [37]. Limited awareness and understanding can prevent circularity from being integrated into business strategy. Coordination is difficult because circular systems depend on collaboration among manufacturers, suppliers, customers, recyclers and regulators. Technological limitations, insufficient expertise and restricted access to investment can delay the development of reverse logistics, remanufacturing and advanced recovery systems. Smaller suppliers may lack the resources and digital infrastructure to collect data or modify production processes [5]. India's fragmented and partly informal vehicle-dismantling system poses additional challenges. Informal recyclers contribute to material recovery and employment but may operate without adequate environmental controls, worker protection, certification or traceability [9]. Formalisation must therefore address social and employment consequences, rather than focusing exclusively on regulatory compliance. Many circular initiatives also remain isolated. Projects may focus on manufacturing waste or water recycling without addressing product life extension, material substitution or end-of-life recovery. Responsibilities may be distributed across departments without a unified governance structure or performance system [17].

CE can improve resource security, reduce waste, preserve material value and lower

exposure to volatile raw-material markets [37]. At the design stage, manufacturers can reduce material use, eliminate problematic substances, design vehicles for durability, repair and disassembly [4]. Procurement can favour recycled or remanufactured materials and suppliers with traceability capabilities [22]. Manufacturing can reduce scrap, reuse packaging and establish industrial symbiosis arrangements [1]. During the use phase, maintenance, digital diagnostics, software updates and spare parts availability can extend vehicle life [4]. At end of life, formal collection, remanufacturing and high-quality recycling can recover economic and material value. Digital technologies, including the Internet of Things, artificial intelligence, and digital product passports, can improve material traceability, predictive maintenance and reverse logistics [38].

Indian automotive manufacturers have introduced initiatives involving manufacturing-waste recycling, component remanufacturing, recycled-materials use, supplier sustainability and battery recycling [39]. The expansion of electric mobility further increases the importance of circular systems because battery manufacturing shifts environmental pressures towards mineral extraction and material processing [6]. Effective implementation therefore requires coordination across India's fragmented automotive value chain rather than isolated recycling initiatives.

Linking ESG Reporting and CE

ESG reporting and CE share objectives in resource efficiency, environmental protection, stakeholder engagement, governance and long-term value creation. ESG frameworks measure energy, emissions, water, waste, supply-chain performance, and CE implementation depends on many of the same information categories [17]. GRI 301 addresses materials, while GRI 306 addresses waste [28,29]. ISO 59004 provides CE vocabulary, principles and implementation guidance, while ISO 59020 addresses circularity measurements [40,41].

Nevertheless, current reporting often remains focused on waste and recycling rather than on product design, circular material inputs and value retention [17].

ESG reporting can enable CE by providing the data, governance and accountability needed for circular decision-making. Companies cannot reduce virgin-material use without measuring material inputs. They cannot manage battery or vehicle recovery without information on products placed on the market and subsequently returned. Remanufacturing also requires data on product condition, component failures, return rates and recovered value. Materiality assessments can identify resource security and end-of-life recovery as strategic issues [17]. Indicators can track progress, governance structures can assign responsibility, and assurance can enhance the credibility of circularity claims. Reporting becomes enabling when its information informs operational decisions rather than being compiled only after activities have occurred.

The environmental pillar aligns most directly with CE through materials inputs, resource use, product lifetime, reuse, remanufacturing, recovery and waste. Energy, water and emissions remain important sustainability indicators but are not inherently measures of circularity [41].

The social dimension helps ensure that circularity does not shift environmental and occupational risks onto vulnerable workers or communities. Reverse logistics, dismantling and recycling can create employment, but may also involve hazardous substances and unsafe working conditions. ESG reporting can support socially sustainable circularity through occupational safety indicators, supplier development and worker training [42]. In India, integrating informal workers into formal recovery networks may require training, protective equipment and access to formal employment opportunities [9].

Governance provides the organisational structure needed to translate circular objectives into action. Board oversight,

defined responsibilities, ethical-sourcing requirements and sustainability-linked incentives can prevent circular initiatives from remaining isolated pilot projects [36]. Governance systems can establish management accountability for material-use targets, supplier traceability and verification of recovery claims. They also facilitate coordination across design, procurement, manufacturing, logistics and after-sales functions [22].

ESG and CE can be mutually reinforcing. Strong ESG systems create governance, data collection, stakeholder engagement and performance-management capabilities that support circular practices. Circular activities can improve ESG performance by reducing virgin-resource use, extending product life, strengthening supply-chain resilience and enhancing material recovery. However, these outcomes depend on the quality of implementation.

Research and Literature Gap

ESG reporting and CE continue to be treated largely as separate domains [17]. The intermediate mechanisms by which reporting enables physical circular transformation remain insufficiently explained [17]. Limited attention has been paid to how materiality assessments, stakeholder engagement, governance structures and data systems influence circular decisions [17]. Research also offers limited guidance for the Indian context. Fragmented supply chains and cost-sensitive manufacturing conditions pose challenges. Informal recovery systems create additional end-of-life governance challenges [9]. Evolving BRSR requirements add a changing regulatory dimension [15].

Accordingly, the principal conceptual gap is not simply the limited integration of ESG reporting and CE, but the insufficient explanation of the organisational mechanisms through which sustainability information is translated into circular operational change. The ESG-CEIF addresses this gap by positioning organisational enabling capacities as the

transmission mechanisms between ESG governance and reporting mechanisms and CE operational practices. It further introduces a feedback process through which circular performance informs subsequent ESG measurement, materiality assessment, target setting and organisational learning.

Conceptual Assumptions and Research Focus

The study assumes that ESG reporting does not automatically drive circular transformation. Its enabling effect depends on the integration of credible ESG information into organisational accountability and decision-making, together with supporting organisational and value-chain capacities [37]. The framework therefore focuses on the mechanisms through which reporting infrastructure is translated into measurable changes in circular practices.

Framework Development

The literature synthesis indicates a sequential relationship in which external sustainability pressures are translated through ESG governance and reporting mechanisms into organisational capacities that enable CE operational practices. These practices generate firm-level sustainable performance outcomes, while resulting information can inform subsequent reporting and organisational learning, the synthesis forms the basis of the five-dimensional ESG-CEIF.

Conceptual Propositions

Proposition 1: External stakeholder, regulatory and market pressures strengthen

the development and organisational integration of ESG governance and reporting mechanisms.

Proposition 2: Greater integration of ESG governance and reporting mechanisms strengthens organisational capacities relevant to CE implementation.

Proposition 3: Stronger organisational enabling capacities increase the implementation of CE operational practices.

Proposition 4: Organisational enabling capacities mediate the relationship between ESG governance and reporting mechanisms and the implementation of CE operational practices.

Proposition 5: Greater implementation of CE operational practices contributes to improved firm-level sustainable performance outcomes.

Proposition 6: Sustainable performance outcomes feed back into subsequent ESG measurement, materiality assessment, target setting and organisational learning.

Although the ESG-CEIF is represented as a sequential analytical model, the proposed relationships should not be interpreted as strictly deterministic or temporally unidirectional. Automotive firms may develop circular practices independently of formal ESG reporting, while existing organisational capabilities may also improve the quality of subsequent reporting. The sequence represents the primary explanatory pathway examined in this paper, with the feedback mechanism recognising the recursive and co-evolutionary nature of reporting, organisational learning and CE implementation.

Figure 2 illustrates the main causal sequence and feedback loop.



Figure 2 - Main Causal Sequence and Feedback Loop

PROPOSED ESG-CE INTEGRATION FRAMEWORK

The proposed ESG-CEIF explains how ESG reporting can enable CE implementation in the Indian automotive industry by linking five interconnected dimensions: external sustainability drivers, ESG governance and reporting mechanisms, organisational enabling capacities, CE operational practices, and sustainable performance outcomes. ESG reporting becomes enabling when sustainable information is translated into measurable priorities, responsibilities and organisational action rather than remaining a static disclosure exercise [18]. External regulatory, stakeholder and market pressures initiate this process, while organisational mechanisms translate these pressures into operational priorities. The framework is recursive, with performance outcomes informing subsequent ESG reporting and organisational learning.

Dimension 1: External Sustainability Drivers

This dimension captures pressures that encourage automotive firms to move away from linear production. Major drivers include regulation, ESG disclosure requirements, investor expectations, customer demand, climate commitments, and supply-chain requirements. Material

scarcity, price volatility and supply disruptions further strengthen the case for efficiency and recovery [37]. Indian automotive firms face producer-responsibility requirements, vehicle scrappage arrangements and rapid electric-vehicle growth [5,10,11]. Dependence on steel, aluminium, and battery minerals makes recycled-material substitution and end-of-life recovery strategically relevant. For example, an electric-vehicle manufacturer may consolidate battery regulation, mineral-price volatility and investor scrutiny into a single material priority: battery lifecycle management.

Dimension 2: ESG Governance and Reporting Mechanisms

This dimension translates external expectations and sustainability information into strategic and operational decisions. Its mechanisms include materiality assessment, stakeholder engagement, ESG indicators, value-chain reporting and assurance. Together, they define objectives and allocate accountability across procurement and production. Traceability is important for recycled-content claims, batteries, critical minerals and component returns [34]. Digital technologies add value when information informs sourcing, design, recovery and investment decisions [38].

Relevant indicators include virgin-material intensity, recycled-material content, scrap recovery end-of-life vehicle returns, remanufacturing yields and supplier traceability. Governance committees can link these indicators to capital expenditure and managerial accountability. For example, a manufacturer may establish an aluminium baseline, set a recycled-content target, require supplier verification, and invest in closed-loop scrap recovery.

Dimension 3: Organisational Enabling Capacities

The six capacities were derived through the integrative synthesis by identifying recurring organisational factors that enable sustainability information to influence operational change [22,34,37,43–45]. They are not intended to represent exhaustive taxonomy of CE capabilities, but rather six recurrent capability domains relevant to the implementation of circular practices in automotive organisations. Collectively, they capture strategic commitment, information and traceability capability, innovation capability, inter-organisational coordination, organisational learning and cultural support for implementation.

Within the ESG-CEIF, these capacities comprise leadership commitment, digital technologies, green innovation, supplier collaboration, organisational learning and sustainability culture. Leadership embeds circularity in strategy [37]. Digital systems enhance traceability [34]. Green innovation supports redesign [43]. Supplier collaboration enables closed-loop value chains [22]. Organisational learning turns data into improved practices [44]. Sustainability culture promotes participation and cross-functional cooperation [45]. These capabilities help firms manage fragmented supply chains, uneven supplier capabilities and limited recovery infrastructure, while coordinating designers, manufacturers, dealerships and recyclers. For example, a firm may establish a cross-functional circularity programme, track selected components, train suppliers, and

incorporate lessons from pilot projects into future designs.

Dimension 4: CE Operational Practices

This dimension applies CE principles throughout the automotive lifecycle to retain value while reducing waste and virgin resource consumption [4]. Key practices include eco-design, circular procurement and secondary-material sourcing, material-use reduction and production scrap recovery, repair, refurbishment, remanufacturing, reverse logistics, and end-of-life vehicle management [4]. These may be grouped into upstream design and procurement, midstream manufacturing efficiency, and downstream collection, reuse and recovery. Applications include designing batteries for disassembly, increasing the use of recycled steel and aluminium, reducing production waste [4]. Collaborating with registered scrapping and recycling facilities is supported by India's formal scrappage framework [10]. For example, an EV producer may collect used batteries through dealerships and allocate them to reuse, second-life storage or recycling based on condition.

Dimension 5: Sustainable Performance Outcomes

The final dimension captures measurable firm-level outcomes of ESG–CE integration. Five major outcome categories are identified: environmental, social, governance, economic, and strategic outcomes. These may include reduced material use and waste, safer workplaces and more responsible supply chains, stronger transparency and accountability, lower costs and greater resource productivity, and improved resilience and competitiveness. For Indian firms, outcomes may include reduced exposure to imported virgin materials, improved compliance and more formalised end-of-life recovery. For example, a closed-loop steel programme may reduce purchases of virgin materials, stabilise costs, improve traceability and lower lifecycle emissions.

At a broader level, aggregated firm-level improvements may contribute to sectoral and national objectives such as resource security, stronger domestic secondary-materials markets, and sustainable industrialisation. These are treated as broader implications rather than direct firm-level outcomes of the framework.

Feedback Mechanisms and Boundary Conditions

The ESG-CEIF embeds continuous improvement through a feedback loop. Sustainable performance outcomes feed into future ESG reporting, revised materiality assessments and investment decisions. Improvement requires granular lifecycle indicators, stronger assurance and better traceability. The framework must remain sensitive to executive commitment, digital maturity, supplier capabilities, recovery infrastructure and market demand. Social safeguards should accompany environmental measures to ensure that circular transformation improves sustainability rather than transferring burdens to workers or communities. These factors condition the strength of the relationship between ESG governance and reporting mechanisms, organisational enabling capacities and CE operational practices.

DISCUSSION

The ESG-CEIF suggests that ESG reporting enables CE implementation not through disclosure alone, but through the organisational mechanisms that convert sustainability information into targets, accountability and operational decisions. Its influence is therefore conditional rather than automatic. Firms with stronger data systems, leadership commitment, cross-functional coordination and value-chain collaboration are more likely to translate ESG information into circular practices [46]. Weak organisational integration may instead leave reporting retrospective or largely symbolic [16]. The framework also identifies an iterative relationship in which

sustainable performance outcomes generate new performance information that supports organisational learning and subsequent reporting cycles. ESG reporting is therefore conceptualised as an enabling organisational infrastructure whose effectiveness depends on the capacity to translate reported information into physical changes in products, processes and material flows. Organisational enabling capacities constitute the mediating layer through which ESG governance and reporting mechanisms can influence CE operational practices.

Theoretical Implications

The principal theoretical contribution lies in connecting three explanatory levels that have typically been treated separately: stakeholder expectations, institutional pressures and firm-level capability development. Their integration explains how external sustainability demands can be translated through ESG reporting infrastructure into organisational capacities that support operational circularity [17].

First, the framework extends the conceptualisation of ESG reporting beyond external disclosure by positioning it as an organisational information and governance infrastructure through which sustainability priorities can influence accountability, decision-making and operational change [18,36]. Second, it extends CE beyond a predominantly technical focus in resource flows by incorporating governance, organisational capabilities and stakeholder accountability into the explanation of circular implementation [17,22,37]. Third, and most importantly, the ESG-CEIF identifies organisational enabling capacities as the transmission mechanism through which ESG governance and reporting mechanisms can be converted into CE operational practices. The transmissions mechanism connects external sustainability pressures with changes in products, processes and material flows and therefore constitutes the central theoretical contribution of the framework.

Managerial Implications

Managers should not treat ESG reporting as merely a compliance or public-relations activity. It can serve as a strategic management system for identifying inefficiencies, supply-chain vulnerabilities and circular value opportunities. Product development, procurement, manufacturing, logistics, and suppliers all influence circular performance. ESG reporting can provide shared objectives and governance structures that support coordination across these functions. Increasing recycled material content, for example, requires procurement standards, supplier traceability, and credible reporting methodologies [22]. Digital technologies can improve material traceability, supply-chain transparency and real-time monitoring [38]. However, technology must be supported by leadership commitment, clear accountability and the integration of ESG information into investment and operational decision-making.

Policy Implications

The framework indicates that India's sustainability reporting and circular-economy policies could be more closely aligned. BRSR reporting requirements, Extended Producer Responsibility provisions, and vehicle scrappage initiatives influence different aspects of automotive circularity [10,11,14]. Their integration may create coordination challenges and overlapping compliance demands. Policymakers could introduce standardised automotive circularity indicators within sustainability reporting guidance. These may include recycled-material inputs, virgin-material displacement, durability, remanufacturing, component reuse, and battery circularity. Sector-specific guidance, and targeted incentives could support smaller suppliers, and recyclers that lack technical and digital capabilities [47]. Incentives linked to audited, traceable circular performance could encourage substantive implementation rather than narrative commitments.

Limitations and Future Research

The framework requires empirical validation. Longitudinal studies could assess whether improvements in ESG reporting maturity precede measurable circular-economy outcomes. Case studies could compare manufacturers and suppliers across varying levels of reporting integration and circular maturity. Survey research and structural equation modelling could test the proposed relationships among external sustainability drivers, ESG governance and reporting mechanisms, organisational enabling practices, CE operational practices and sustainable performance outcomes. Mediation analysis could specifically examine Proposition 4 by testing whether organisational enabling capacities mediate the relationship between ESG governance and reporting mechanisms and CE operational practices. Particular attention should be given to boundary conditions such as recovery infrastructure, regulatory stability, market demands and value-chain maturity. Comparisons across manufacturers, smaller suppliers, recyclers and national contexts would further assess the framework's generalisability. The first major risk is greenwashing, in which firms use circular terminology without altering physical material flows or business models [48]. A second risk is metric tunnel vision, in which organisations optimise a reported indicator while neglecting overall system performance [49]. A third risk is environmental burden shifting, whereby an improvement in one part of the system creates impacts elsewhere [50]. Circular transitions may also generate uneven social impacts across workers and communities [42]. Circular practices must therefore consider worker safety, human rights, and the distribution of transition costs and benefits. The framework may also increase administrative and data-collection burdens, particularly for smaller firms and informal value-chain participants [9,47]. More information does not automatically improve decisions if analytical capacity, leadership commitment or accountability

remain weak. The framework's effectiveness will therefore depend on reporting credibility, organisational capacity and whether ESG information materiality influences decision-making.

CONCLUSION

This conceptual paper addresses the question: How can ESG reporting enable CE implementation in the Indian automotive industry? It concludes that ESG reporting becomes an enabler when sustainability information is linked to governance, strategy, investment decisions, and stakeholder accountability. Reporting alone does not create circularity; its value emerges when disclosure influences organisational action.

The ESG-CEIF combines ST, IT, and NRBV to connect external sustainability expectations and pressures with organisational capability development and CE implementation. The framework integrates ESG reporting and CE principles into a single conceptual model. It extends ESG reporting beyond compliance, positioning it as an organisational infrastructure that supports capability development, performance measurement, accountability, and continuous improvement. It also contextualises this relationship within the specific regulatory, supply-chain, and end-of-life challenges facing the Indian automotive industry. The framework provides managers and policymakers with a structured approach to linking ESG indicators to circular activities, including responsible sourcing, product-life extension, reuse, remanufacturing, reverse logistics, and material recovery. It can also strengthen traceability, support green investment, improve accountability, and increase organisational resilience.

Future research should empirically validate the framework through case studies, surveys, quantitative modelling, and mixed-methods research. Studies should develop circularity indicators for ESG reporting and examine their implementation among automotive manufacturers, component

producers, and lower-tier suppliers. The central conclusion is that ESG reporting enables circularity when disclosure becomes a management practice. When embedded in strategic and operational processes, it can support innovation, accountability, resource security, resilience, and long-term sustainable transformation in the Indian automotive industry.

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