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Corporate Pathways to Sustainability through Resource Management in Indian Enterprises

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Abstract. India's private sector plays a pivotal role in achieving national and global sustainability goals amid rapid economic growth and environmental challenges. This study employed a qualitative-comparative approach by analyzing sustainability practices of five leading conglomerates namely Tata Group, Aditya Birla Group, Reliance Industries, Adani Group, and ITC using company reports, secondary data, and sectoral benchmarks. Three thematic areas were examined: (1) water and energy management, (2) material management and circular economy, and (3) corporate sustainability goals. The findings show measurable progress in resource efficiency: Tata Steel reduced water consumption by 24.5% (2012–2023), Tata Motors cut energy use per vehicle by 16.2% (2012–2023), and UltraTech Cement substituted 21% of virgin raw materials with industrial waste (target 50% by 2030). Renewable adoption reached 27.8% in Tata Group's energy mix, while Reliance developed a 20 GW renewable portfolio. Strategic goals vary, with Adani committing to net-zero by 2029, Tata Group by 2045, and Reliance by 2070, reflecting different levels of ambition and feasibility. Indian conglomerates demonstrate alignment with international climate agendas through renewable investment, carbon reduction, and circular economy models. However, uneven disclosure, fragmented regulatory frameworks, and technological uncertainties remain challenges. Corporate sustainability in India has shifted from peripheral CSR activities to central business strategies, with resource management and net-zero commitments shaping competitiveness and resilience. Limitations include reliance on secondary data; future research should expand to primary fieldwork and cross-country comparisons to deepen insights into corporate sustainability pathways.

Keywords: Corporate Sustainability; Resource Management; Circular Economy; Net-Zero Commitments; Indian Conglomerates

1. Introduction

Sustainability has emerged as a cornerstone of modern business practices, bringing together economic prosperity, social equity, and environmental stewardship in a rapidly changing world (Crane et al., 2022; Pratama et al., 2023; Taherdoost, 2023). Scholars note

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that climate change, resource depletion, and social inequality demand that businesses move beyond profit maximization toward models that balance economic goals with social and environmental well-being (Byaro et al., 2023; Grijalvo & García-Wang, 2023; Perlin et al., 2022; Ponomarenko et al., 2021; Zhang et al., 2021). Across the globe, corporations are being redefined not only as economic actors but also as drivers of sustainable development.

In India, this shift is particularly pressing. The country's rapid economic growth and accelerated industrialization have created immense pressures on natural resources, leading to environmental degradation, social disparities, and heightened climate vulnerabilities (Patel & Mehta, 2023; Sato & Aggarwal, 2020; Wang et al., 2018). At the same time, India is home to some of the world's largest conglomerates that possess the capacity and influence to spearhead sustainable practices. This dual reality, environmental urgency alongside corporate capacity makes the Indian private sector a compelling arena for sustainability studies.

Existing literature highlights how sustainable resource management contributes to reducing operational costs, enhancing corporate image, and supporting long-term resilience (Dharmayanti et al., 2023). Frameworks such as the Triple Bottom Line (TBL) and the Sustainable Development Goals (SDGs) have guided businesses worldwide in assessing and improving their sustainability impact (Gu et al., 2021; Hammer & Pivo, 2017; Khan et al., 2021). Yet, much of the scholarship emphasizes Western contexts, with relatively fewer empirical studies that capture the unique challenges and opportunities of Indian enterprises.

This gap becomes evident when examining resource management strategies in Indian corporations. While case studies exist on large firms like Tata Group or ITC Limited, the broader landscape of practices across diverse private enterprises remains underexplored. Many studies also focus on isolated aspects such as energy efficiency or water management, leaving limited integrative analysis of how companies navigate economic, social, and environmental dimensions simultaneously. This lack of comprehensive, India-specific insights presents an opportunity for further scholarly contribution.

Addressing this gap is significant for both academic and practical reasons. Academically, it advances understanding of sustainability in non-Western contexts, enriching global theories with localized insights. Practically, it provides guidance for businesses seeking to improve efficiency while fulfilling their environmental and social responsibilities. For policymakers and civil society, such knowledge helps identify where regulatory frameworks, incentives, and partnerships can best support corporate sustainability pathways.

This research is therefore designed with clear objectives. First, it seeks to assess the current state of sustainable resource management practices across Indian private enterprises. Second, it aims to identify challenges and barriers, including financial constraints, fragmented regulations, and limited awareness. Third, it highlights opportunities and best practices that can serve as models for other businesses. By integrating survey data, interviews, and corporate case studies, the study provides a holistic picture of sustainability pathways in the private sector.

This paper argues that corporate pathways to sustainability in India must be understood not only in terms of environmental outcomes but also as strategic routes that integrate profitability, competitiveness, and social legitimacy. By advancing resource management practices, Indian enterprises can contribute meaningfully to national and

global sustainability agendas. In doing so, they reaffirm the private sector's role as a partner in shaping a more equitable, resilient, and environmentally secure future.

2. Methods

This study employed a qualitative case study approach supported by quantitative content analysis of corporate sustainability data. The methodological framework was designed to capture measurable patterns of sustainability adoption alongside strategic narratives embedded in corporate reporting (Seawnght & Gerring, 2008).

Data collection relied primarily on secondary sources, including annual sustainability reports, official disclosures, and corporate websites of leading Indian enterprises: Tata Group, Aditya Birla Group, Reliance Industries, Adani Group, and ITC Limited. These sources provided verified numerical data on indicators such as water and energy efficiency, renewable energy integration, circular economy practices, and net-zero commitments. For example, reported reductions in water and energy consumption, percentage of renewable energy integration, and timelines for carbon neutrality formed the quantitative basis of the analysis.

Case studies were selected to illustrate corporate sustainability strategies in practice (Baxter & Jack, 2015; Hyett et al., 2014). The five chosen conglomerates represent India's industrial leaders with significant public documentation of sustainability performance. Each case was examined for initiatives related to water conservation, renewable energy projects, circular economy adoption, carbon reduction strategies, and sustainable agriculture programs. Comparative analysis across cases allowed for the identification of shared patterns and distinct corporate trajectories.

To ensure analytical rigor, the study employed comparative content analysis and thematic coding. Corporate data were categorized into environmental urgency, net-zero targets, renewable investments, community integration, and business resilience, following the sustainability framework. This coding process enabled the integration of both numerical performance metrics and qualitative strategic insights.

While the study focused on secondary data to ensure reliability and comparability across companies, its scope was limited by the availability and transparency of reported information. Nevertheless, the methodological design provided a holistic perspective on how India's largest corporations are aligning sustainability strategies with long-term business resilience.

3. Results and Discussion

3.1. Comparative Analysis of Water and Energy Management

The comparative assessment of water management practices among Indian conglomerates indicates that structured conservation measures are increasingly embedded in corporate sustainability strategies. The Tata Group stands out, having achieved water-positive status in 30 of its water-intensive units by 2023. Similarly, Tata Steel reported a 24.5% reduction in specific water consumption between 2012 and 2023, demonstrating systematic efficiency improvements. ITC Limited has strengthened water stewardship through large-scale watershed development projects, ensuring replenishment of more water than consumed. Meanwhile, Adani Group has prioritized water conservation within its industrial operations, while Reliance Industries and the Aditya Birla Group have outlined commitments without yet disclosing measurable data. Collectively, these initiatives highlight water management as a key pillar of corporate environmental responsibility in India.

In terms of energy management, the findings reveal ambitious targets supported by measurable progress. The Tata Group has integrated renewable energy into its operations, achieving 27.8% of its energy mix from renewable sources by 2023, against a target of 40% by 2030. Tata Motors has complemented this effort by reducing energy consumption per vehicle by 16.2% over the past decade. Reliance Industries has pledged to transition fully to green energy by 2030, aligning its corporate strategy with national and global decarbonization goals. Aditya Birla Group continues to emphasize renewable energy integration, while the Adani Group is targeting net-zero carbon emissions by 2029 through large-scale investments in solar and wind capacity. Although ITC has not disclosed specific figures, it remains committed to renewable energy adoption. Together, these initiatives underscore the dual role of energy efficiency and renewable transition as drivers of operational sustainability and long-term competitiveness.

Table 1 Water Management Practices

Group	Target/Initiative	Specific Data (if available)
Tata Group	Water-positive status for all water-intensive units	30 units achieved by 2023
Tata Steel	Reduced specific water consumption	24.5% reduction (2012–2023)
Aditya Birla Group	Not available	–
Reliance Industries	Water conservation focus	–
Adani Group	Focus on water conservation	–
ITC	Water management efforts	–

Table 1 reveals that the Tata Group demonstrates the most advanced and measurable progress, achieving water-positive status across 30 water-intensive units by 2023. Complementing this, Tata Steel successfully reduced its specific water consumption by 24.5% between 2012 and 2023, underscoring a decade-long commitment to efficiency. ITC also invests in water stewardship through integrated management efforts, although specific quantitative outcomes are not disclosed. Reliance Industries and the Adani Group highlight water conservation as a strategic focus, yet detailed performance indicators remain limited. In contrast, the Aditya Birla Group has not made data publicly available, indicating variability in transparency and reporting across these leading conglomerates.

Table 2 Energy Management Practices

Group	Target/Initiative	Specific Data (if available)
Tata Group	40% renewable energy in the mix by 2030	27.8% achieved as of 2023
Tata Motors	Energy consumption reduction per vehicle	16.2% reduction (FY 2012–13 to 2022–23)
Aditya Birla Group	Focus on renewable energy integration	–
Reliance Industries	100% green energy for net consumption by 2030	–
Adani Group	Net-zero carbon emissions by 2029	–

ITC	Not available	–

Table 2 on energy management practices illustrates the diverse strategies pursued by India's leading conglomerates in advancing sustainability goals. The Tata Group has made tangible progress, achieving 27.8% renewable energy in its mix by 2023, moving toward its 40% target for 2030. Tata Motors supports this trajectory by reducing energy consumption per vehicle by 16.2% over the decade from FY 2012–13 to 2022–23. Reliance Industries demonstrates long-term ambition with its pledge to source 100% of net energy consumption from green energy by 2030, while the Adani Group sets a more aggressive timeline by aiming for net-zero carbon emissions by 2029. The Aditya Birla Group signals a focus on renewable energy integration but lacks publicly available quantitative data, and ITC does not report specific initiatives in this area.

3.2. Material Management, Circular Economy, and Carbon Reduction

Material management in India's leading conglomerates reflects a gradual but steady shift from linear consumption models toward circular economy approaches. The Aditya Birla Group's UltraTech Cement demonstrates industry leadership by utilizing industrial by-products such as fly ash to replace virgin raw materials, currently achieving a 21% substitution rate and targeting 50% by 2030. This not only reduces pressure on natural resources but also creates pathways for scaling industrial symbiosis within the construction sector. Similarly, Tata Motors sets a clear benchmark with its commitment to integrate 30% recycled content into vehicles by 2025, showing how material efficiency can align with product innovation.

Tata Steel and ITC further illustrate how material management can involve social dimensions. Tata Steel prioritizes sustainable sourcing through social and farm forestry initiatives, while ITC's raw fibre procurement strategy integrates community engagement, thereby strengthening rural livelihoods. Such practices underscore that material management is not merely about resource efficiency but also about embedding social equity into corporate sustainability agendas. This multi-dimensional approach distinguishes Indian firms in their pursuit of circularity.

When it comes to carbon reduction, the strategies adopted are equally diverse and ambitious. ITC focuses on expanding renewable energy use across its operations, directly lowering its dependency on fossil fuels. The Aditya Birla Group invests in energy-efficient production processes, with Grasim Industries modernizing its manufacturing systems to minimize emissions. Tata Steel experiments with emerging technologies such as carbon capture and hydrogen-based steelmaking, positioning itself at the frontier of industrial decarbonisation. These initiatives demonstrate that carbon reduction is increasingly being embedded into core business strategies rather than peripheral CSR activities.

Reliance Industries and the Adani Group represent the energy sector's aggressive pivot toward decarbonisation. Reliance has built a 20 GW renewable energy portfolio and initiated pilot projects in green hydrogen, aligning with its long-term net carbon neutrality goal. Adani, on the other hand, commits to becoming net-zero by 2029 through large-scale renewable projects and investments in green hydrogen infrastructure. Both companies emphasize large-scale infrastructural transformation as central to India's clean energy transition.

Collectively, the comparative analysis suggests that while progress varies in scale and technological sophistication, India's conglomerates are moving in a convergent direction toward material efficiency, circular economy models, and carbon reduction. Their

initiatives indicate a strong alignment with global climate targets, yet the uneven disclosure of specific performance data highlights the need for standardized sustainability reporting frameworks. The integration of renewable energy, recycling, and advanced technologies such as carbon capture and hydrogen fuel represents critical steps toward reconciling economic growth with environmental stewardship.

Table 3 Material Management and Circular Economy

Group	Target/Initiative	Specific Data
Tata Group	Increased use of recycled content	Tata Motors aims for 30% recycled content in vehicles by 2025
Tata Steel	Sustainable sourcing	84% of fibre sourced from Social and Farm Forestry initiatives (2023 data)
Aditya Birla Group	Circular economy in cement production	UltraTech Cement achieved 21% substitution of virgin raw materials with industrial waste (target 50% by 2030)
Reliance Industries	Circular economy focus	Developing recycling technologies; integrating recycled plastics in product lines
Adani Group	Not available	–
ITC	Sustainable sourcing	84% of fibre sourced from Social and Farm Forestry initiatives (2023 data)

Table 3 on material management and circular economy highlights how Indian conglomerates are adopting diverse pathways to reduce reliance on virgin resources and promote sustainable production. Tata Motors, under the Tata Group, demonstrates a clear target by committing to 30% recycled content in vehicles by 2025, while Tata Steel and ITC both report that 84% of their raw fibre is sourced through social and farm forestry, linking material efficiency with community development. UltraTech Cement of the Aditya Birla Group showcases industry leadership by substituting 21% of virgin raw materials with industrial waste and fly ash, with an ambitious target of 50% by 2030. Reliance Industries focuses on recycling innovation, particularly through the integration of recycled plastics into its product portfolio, indicating a technological pathway toward circularity. In contrast, the Adani Group does not provide specific data in this area, reflecting variation in both commitment and transparency across companies. The table underscores a gradual but significant transition toward circular models in material management, though progress remains uneven among enterprises.

Table 4 Carbon Reduction Practices

Company	Focus Area	Specific Initiatives	Impact on Carbon Footprint
ITC Limited (ITC)	Renewable Energy	Expanded solar and wind power usage	Reduced fossil fuel reliance
Aditya Birla Group (ABG)	Climate Change Mitigation	Energy-efficient technologies, process modernization	Lower energy intensity across operations
Tata Steel (Tata Group)	Process Innovation	Trials with carbon capture and hydrogen steelmaking	Potential to cut CO_2 emissions significantly
Reliance Industries	Renewable Energy	20 GW renewable energy portfolio; pilot green	Decarbonisation of refining and energy

(RIL)	Transition	hydrogen projects	operations
Adani Group	Green Hydrogen Mission	Investments in renewable megaprojects and hydrogen infrastructure	Potential zero-carbon fuel adoption

Table 4 on carbon reduction practices demonstrates the varied strategies employed by India's leading conglomerates to address climate change. ITC advances renewable energy adoption through expanded solar and wind power, reducing its dependence on fossil fuels. The Aditya Birla Group focuses on climate change mitigation via energy-efficient technologies and modernization of industrial processes, lowering energy intensity across its operations. Tata Steel pursues process innovation, notably experimenting with carbon capture and hydrogen-based steelmaking, which hold the potential to significantly reduce CO_2 emissions. Reliance Industries invests heavily in a renewable energy transition, building a 20 GW renewable portfolio and piloting green hydrogen projects to decarbonize its refining and energy operations. Similarly, the Adani Group anchors its strategy in a Green Hydrogen Mission, channeling resources into large-scale renewable energy and hydrogen infrastructure with the potential to enable zero-carbon fuel adoption. Collectively, these initiatives reflect an industry-wide shift toward technological and infrastructural pathways for long-term decarbonisation.

3.3. Corporate Sustainability Goals and Strategic Outlook

The long-term sustainability commitments of Indian conglomerates illustrate a growing recognition of the urgency of climate action and the strategic value of aligning with global environmental agendas. Tata Group demonstrates sectoral leadership by setting a net-zero emissions target for 2045, positioning itself ahead of India's national timeline of 2070. Aditya Birla Group also stands out, particularly through UltraTech Cement's net-zero concrete target by 2050, reflecting innovation within one of the most resource-intensive industries. These commitments highlight that leading firms are moving beyond compliance toward proactive goal setting, anchoring sustainability as a central pillar of corporate strategy.

Reliance Industries aligns its goals with India's national commitments by targeting net carbon neutrality by 2070. While its timeline is longer compared to peers, the company's scale and influence mean that even incremental shifts can have significant impacts at the national level. Reliance's ongoing investment in renewable energy and green hydrogen projects suggests that its slower timeline is balanced by technological ambition and infrastructure transformation. This reflects a strategy of gradual but large-scale decarbonisation that complements the broader national transition.

Adani Group adopts one of the most aggressive positions in the sector, committing to net-zero carbon emissions by 2029. This ambitious timeline underscores the group's intent to project leadership in renewable energy and green hydrogen, particularly through megaprojects in solar and wind power. If realized, Adani's approach could serve as a benchmark for other conglomerates in demonstrating how rapid transitions are possible in emerging economies. However, such ambitious goals also raise questions of feasibility and transparency, making consistent progress reporting crucial for credibility.

ITC Limited presents a different strategic outlook, focusing less on explicit net-zero commitments and more on building resilience and social sustainability. Its water-positive status and farmer-oriented climate adaptation programs exemplify how sustainability can be framed not only as an environmental necessity but also as a socio-economic

responsibility. While the absence of a clear net-zero timeline may appear as a gap, ITC's emphasis on community integration and resource stewardship strengthens its legitimacy in other dimensions of corporate sustainability.

A comparative analysis across these conglomerates indicates that strategic sustainability goals are shaped by both industrial characteristics and corporate identity. Heavy industries like steel and cement adopt technology-intensive pathways such as carbon capture and alternative raw material usage, while diversified groups pursue renewable energy expansion and ecosystem initiatives. The variance in timelines from Adani's near-term target of 2029 to Reliance's 2070 pledge demonstrates a balance between ambition and feasibility, with firms tailoring their approaches to operational capacities and market conditions.

Corporate sustainability in India's private sector has moved from peripheral initiatives to becoming central in shaping competitiveness, risk management, and long-term legitimacy. Conglomerates increasingly recognize that integrating renewable energy, circular economy principles, and carbon mitigation strategies is not only environmentally imperative but also economically strategic. These long-term goals and strategic outlooks reflect a sectoral transformation where resource management and sustainability commitments are indispensable drivers of future business resilience and global relevance.

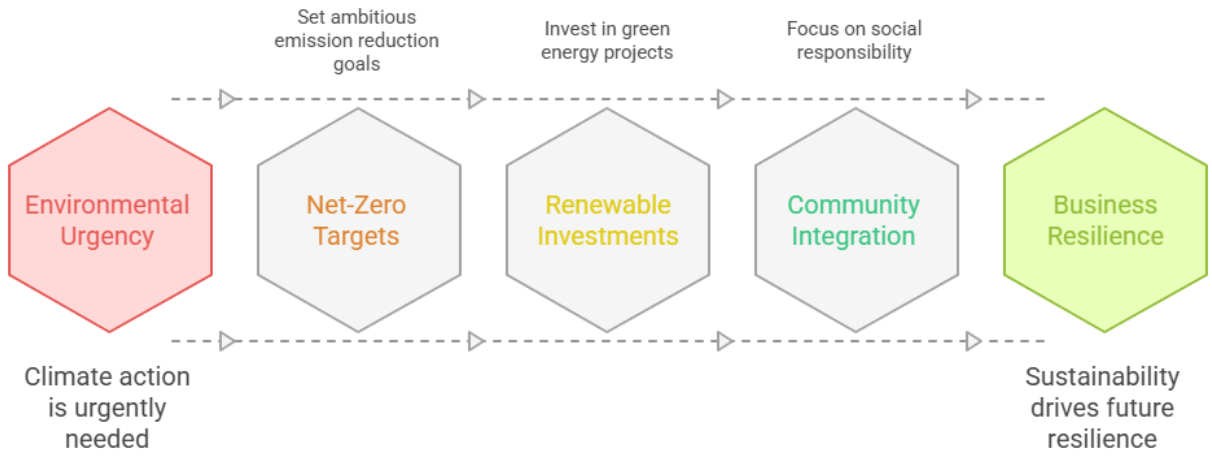

Figure 1 Achieving Corporate Sustainability Goals

Figure 1 illustrates the pathway toward achieving corporate sustainability goals, beginning with the recognition of environmental urgency, which highlights the need for immediate climate action. From this starting point, companies are encouraged to set net-zero targets by establishing ambitious emission reduction commitments. The next stage involves making renewable investments, particularly in green energy projects, as a practical step toward decarbonisation. Sustainability also requires community integration, where businesses focus on social responsibility and ensure that local stakeholders benefit from corporate initiatives. Ultimately, these combined efforts contribute to business resilience, underscoring that sustainability is not only an environmental necessity but also a strategic driver of long-term corporate stability and competitiveness.

3.4. Corporate Sustainability Pathways in India

The findings from the comparative analysis of water and energy management, material management and circular economy, and corporate sustainability goals collectively reveal that Indian conglomerates are moving decisively toward sustainability pathways, though with varying degrees of ambition, technological adoption, and disclosure. This aligns with the broader global shift in corporate sustainability strategies, where resource efficiency and decarbonisation have become central to long-term competitiveness (Francisco & Linnér, 2023; Miró, 2020). In particular, Tata Group's leadership in water stewardship and renewable energy integration illustrates how systemic approaches to resource management can generate operational efficiency while addressing ecological risks.

Water management initiatives, such as Tata Group's achievement of water-positive status and ITC's watershed programs, resonate with global best practices emphasizing corporate responsibility in water-stressed regions. According to the World Resources Institute (Fukase & Martin, 2020; Kraft, 2014), India faces one of the highest levels of water stress globally, making corporate interventions vital to ensuring resilience. These findings suggest that Indian conglomerates are not merely reacting to regulatory pressure but are adopting proactive water governance models that secure both business continuity and community well-being. However, as the analysis indicates, gaps in transparency particularly among companies like Aditya Birla and Adani highlight the need for standardized water reporting frameworks.

In terms of energy transition, the commitments made by Reliance Industries and Adani Group toward green hydrogen and renewable energy megaprojects demonstrate alignment with India's national pledge to achieve net-zero by 2070 (Sharma et al., 2024). The International Energy Agency (Heubaum & Biermann, 2015; Scott & Gössling, 2021) stresses that large-scale renewable deployment and hydrogen adoption are critical for decarbonising emerging economies. Tata Motors' measurable energy efficiency achievements further illustrate how operational-level initiatives can complement national energy targets. Yet, the uneven availability of performance metrics, especially from ITC and Aditya Birla, reflects a broader challenge in corporate sustainability reporting across developing contexts.

Material management and circular economy practices reflect another dimension of India's sustainability transition. UltraTech Cement's substitution of virgin materials with fly ash and industrial waste aligns with the World Business Council for Sustainable Development (Irving & Helin, 2018; Stigson, 2015), which advocates scaling industrial symbiosis to cut emissions from hard-to-abate sectors. Similarly, Tata Motors' commitment to integrating recycled content in vehicles mirrors circular economy models increasingly promoted in global manufacturing (Keiser & Tortora, 2022). These initiatives reveal how Indian enterprises are gradually embedding circularity into core operations, though the absence of measurable outcomes from groups like Adani underscores the sectoral variation in readiness.

The ambitious net-zero commitments also reflect strategic positioning within global climate governance frameworks. Adani's pledge for net-zero by 2029, Tata Group's 2045 timeline, and Reliance's alignment with India's 2070 goal illustrate both competitive differentiation and pragmatic alignment with national priorities. According to KPMG India (Ramkumar, 2023), sustainability commitments have become integral to brand reputation and investor confidence in Indian conglomerates. ITC's emphasis on water positivity and farmer-focused resilience programs further illustrates how corporations

integrate social sustainability alongside environmental goals, reinforcing the notion that sustainability strategies must be multidimensional.

The discussion highlights that while progress varies across conglomerates, there is a convergent trend toward embedding sustainability into corporate strategy. This confirms existing scholarship that resource management, renewable energy integration, and carbon reduction are no longer peripheral but central to business legitimacy in emerging economies (Lefebvre et al., 2022). To ensure credibility, however, greater emphasis on transparency, independent verification, and standardized sustainability reporting will be essential. Future research could explore how these corporate sustainability pathways intersect with policy frameworks and community outcomes, particularly in balancing growth, equity, and environmental stewardship in India's rapidly industrializing economy.

4. Conclusions

The findings confirm that Indian conglomerates are actively pursuing sustainability across resource management, circular economy, and net-zero commitments. In water and energy efficiency, Tata Steel reduced specific water consumption by 24.5% (2012–2023) and Tata Motors achieved a 16.2% reduction in energy consumption per vehicle (2012–2023). Tata Group also integrated 27.8% renewable energy in its mix by 2023, while UltraTech Cement substituted 21% of virgin raw materials with industrial waste, targeting 50% by 2030. These results indicate that sustainability is no longer peripheral but a measurable driver of corporate efficiency and resilience.

The discussion reveals divergence in strategic outlooks, with Adani Group setting the most ambitious timeline of net-zero by 2029, Tata Group aiming for 2045, and Reliance aligning with India's national goal of 2070. ITC, while lacking explicit net-zero targets, contributes through water positivity and community-based climate programs that have trained 1.5 million farmers in climate-resilient practices. These findings suggest that Indian conglomerates balance ambition with feasibility, integrating renewable investments, carbon reduction technologies, and social responsibility in diverse ways.

This study is limited by its reliance on secondary data from corporate sustainability reports, which vary in detail and transparency, limiting comparability across companies. Future research should incorporate primary fieldwork and independent verification of corporate claims, while also expanding to cross-country comparisons with other emerging economies to assess how regulatory and market contexts shape corporate sustainability trajectories.

Declaration of conflicting interests

All authors declare that they have no conflicts of interest.

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