

How AI is Changing ESG and Sustainability Reporting

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Peer Review Information	Abstract
Type: Article Received: 12 April 2026 Revised: 03 May 2026 Accepted: 10 June 2026 Published: 05 July 2026	This review synthesizes five recent peer-reviewed studies (2024–2025) examining the role of artificial intelligence (AI) in Environmental, Social, and Governance (ESG) and sustainability reporting. Drawing on systematic literature reviews, bibliometric analyses, applied reviews, and one empirical regression study, the paper identifies key AI technologies including machine learning (ML), natural language processing (NLP), IoT, and blockchain that enhance reporting accuracy, automation, and transparency. It maps converging themes around AI-enabled ESG improvements while critically examining divergences, including algorithmic opacity, the social sustainability gap, geographic inequities, and the paradoxical negative short-run effect of AI on ESG scores documented empirically. The paper concludes with an integrated research agenda. Keywords: Artificial Intelligence; ESG Reporting; Sustainability Reporting; Machine Learning; Digital Transformation

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Introduction

Global regulatory frameworks including the UN SDGs, the Paris Agreement, the EU Taxonomy, and the TCFD have intensified pressure on organizations to disclose ESG performance with precision and credibility. Traditional reporting faces persistent challenges: fragmented data, inconsistent standards across GRI and SASB frameworks, greenwashing risks, and high verification costs. Artificial intelligence has emerged as a proposed solution, offering capabilities in automated data collection, predictive modelling, real-time monitoring, and compliance tracking (Mustafa et al., 2025; Berniak-Wozny, 2025).

Five studies, varying considerably in methodology and scope, form the basis of this synthesis. Mustafa et al. (2025) conducted a systematic literature review (SLR) of 135 articles; Berniak-Wozny (2025) applied bibliometric analysis to 304 documents; Rane et al. (2024) and Gupta & Agarwal (2025) produced applied conceptual reviews; and Khichi (2024) contributed the only empirical regression study, using data from 1,463 Chinese listed firms. Together, they span theoretical, structural, applied, and quantitative dimensions of the AI-ESG relationship.

Literature Survey

The existing body of research on AI in ESG reporting can be broadly categorized into four streams: systematic reviews, bibliometric analyses, applied conceptual studies, and empirical investigations. Systematic reviews synthesize large corpora of literature and conclude that artificial intelligence significantly enhances ESG reporting through automation, predictive analytics, and decision support systems. Bibliometric analyses highlight the rapid growth of AI-ESG research, while also identifying gaps such as the underrepresentation of social sustainability and limited geographic diversity. Applied reviews focus on practical implementations of AI technologies such as machine learning (ML), natural language processing (NLP), Internet of Things (IoT), and blockchain in corporate sustainability contexts. These studies emphasize real world use cases but often lack methodological rigor. Empirical studies provide quantitative validation, demonstrating that digitalization positively impacts ESG scores, while also revealing unintended consequences such as increased energy consumption. Overall, the literature shows strong agreement on the transformative role of AI but remains fragmented in terms of empirical validation and interdisciplinary integration

Comparative Summary

Paper	Type	Sample/Scope	Key Finding	Limitation
Mustafa et al. (2025)	Systematic LR	135 articles, 1996–2024	AI improves ESG; warns of externalities; proposes framework	No primary data
Berniak-Wozny (2025)	Bibliometric	304 articles, 2015–2025	Rapid growth; social gap; Africa absent; empirical deficit	No empirical testing
Rane et al. (2024)	Applied Review	Multi-DB literature	Comprehensive AI-ESG taxonomy across all 3 pillars	No systematic selection
Gupta & Agarwal (2025)	Applied Review	Multi-DB + case studies	Corporate cases (Google, Unilever, MS); XAI agenda	Modest theory depth
Khichi (2024)	Empirical Regression	1,463 firm-years, China	Digitalization positive; AI has rebound/environmental costs	Single-country sample

AI as a General-Purpose Enabler

Artificial intelligence functions as a general-purpose technology in ESG and sustainability management.

AI enables:

- Data automation using NLP
- Real-time monitoring using IoT
- Predictive analytics using ML
- Decision support systems
- Transparency via blockchain

AI aligns with Resource-Based View and Stakeholder Theory, making it a strategic enabler of sustainable transformation

Problem Statement

ESG reporting faces challenges such as fragmented data, lack of transparency, manual processes, and limited real-time monitoring. AI introduces solutions but also creates challenges like bias, lack of explainability, and high energy consumption.

Core Problem:

How can AI enhance ESG reporting while addressing ethical, environmental, and methodological limitations?

Research Gaps and Future Directions

Based on the synthesis, six priority areas emerge for future research:

- Empirical validation: longitudinal multi-country datasets, field experiments, and randomized comparisons of AI-enabled versus traditional ESG reporting are urgently needed.
- Social ESG dimension: AI tools specifically targeting labour equity, community inclusion, and accessibility require dedicated development and empirical testing.
- Geographic inclusion: research must expand to Africa, South Asia, and Latin America, where sustainability challenges are most acute.
- Net environmental cost of AI: life-cycle analyses of AI systems deployed in ESG contexts are needed to resolve the rebound paradox documented by Khichi (2024).
- Explainability and ethics: XAI applications in sustainability reporting, combined with regulatory frameworks such as the EU AI Act, should be examined collaboratively across disciplines.
- Global standardization: collaborative development of AI-ESG metrics across GRI, ISSB, SEC, and industry actors is essential for cross-firm comparability.

Conclusion

This review demonstrates that AI offers genuine and wide-ranging capabilities to improve ESG and sustainability reporting enhancing accuracy, efficiency, real-time monitoring, and stakeholder transparency. The convergence of ML, NLP, IoT, and blockchain technologies creates new possibilities for addressing the structural weaknesses of conventional disclosure practices. However, the synthesis also reveals that current scholarship skews heavily toward conceptual frameworks over empirical evidence; overstates environmental and governance benefits relative to social sustainability; and concentrates in a narrow band of geographies and sectors. Most critically, Khichi's (2024) empirical finding that AI's own carbon footprint can produce ESG rebound effects demands serious theoretical and practical attention. Future progress requires more rigorous empirical research, greater geographic and sectoral diversity, and honest governance of AI's own sustainability implications.

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