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Sustainability in Financial Reporting: The Role of AI-Powered Predictive Analytics

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ABSTRACT

Artificial Intelligence (AI) is revolutionizing sustainability reporting with greater accuracy, efficiency, and transparency in Environmental, Social, and Governance (ESG) disclosures. This paper uses a systematic literature review in line with PRISMA guidelines to explore how AI-based predictive analytics is improving sustainability-related financial reporting. Three research questions underpin this paper: (1) how AI-based predictive analytics is improving ESG reporting, (2) challenges and benefits in adopting AI, and (3) future trends in AI-based sustainability reporting. Research indicates that AI significantly enhances ESG reporting through data-gathering automation, trend identification in sustainability, and greenwashing minimization. AI-based predictive models enhance business decision-making through sustainability risk forecasting and regulatory compliance. Ethical risks, regulative uncertainty, high implementation cost, and data privacy are a few challenges that restrict AI adoption. New areas of focus include trends like explainable AI (XAI), AI-based ESG investment, and AI-based forecasting in finance. The study has direct applicability for firms to implement AI in ESG reporting and recommends policy interventions to introduce standardization in AI usage in sustainability disclosures. Future research should develop AI models tailored to small and medium-sized firms (SMEs) and investigate AI's role in countering sustainability misinformation. With effective implementation, AI can revolutionize ESG reporting, enhancing corporate accountability and sustainability performance in the long run.

INTRODUCTION

Sustainability reporting has become a priority for businesses across the world. Stakeholders, investors, regulators, and businesses increasingly affirm that simple success in finance is not enough to establish a business's viability in the long term. ESG considerations are being viewed as increasingly significant in finance/investment decision-making, corporate disclosure, and evaluating risks (Özer *et al.*, 2024). Coelho *et al.* (2023) affirm that businesses have to provide sustainability disclosures apart from traditional reports to allow stakeholders to better assess corporate impact on nature and society. Sustainability reporting is no longer a voluntary requirement for most businesses as several jurisdictions have made ESG disclosure mandatory. There are still problems with inconsistent reporting guidelines, data accuracy, and complexity in integrating sustainability information in financial reports.

Financial reporting is revolutionized with AI through enhanced data gathering, processing, and predictive analytics. According to Gotoman *et al.* (2025), AI has attracted attention globally due to its wide range of uses in different fields, such as entertainment, business, medicine, and education. It has emerged as a critical tool to address the problem of lack of transparency in AI systems (Undie *et al.*, 2024). AI predictive analytics allows companies to process massive ESG data, identify patterns, and forecast sustainability risks and opportunities with better accuracy (Sariyer *et al.*, 2024). Although conventional methods in financial reporting are limited in collecting information that is not finance-

based from heterogeneous sources like sustainability reports, news releases, and social media, AI can collect from heterogeneous sources with automation and provide a better integrated picture of a business's ESG performance (Zhang & Yang, 2024). AI models enhance accuracy in sustainability disclosures with functionality to detect inconsistencies and anomalies and to verify reporting frameworks like the Global Reporting Initiative (GRI) and the International Sustainability Standards Board (ISSB) framework (Moodaley & Telukdarie, 2023). AI predictive analytics in sustainability reporting has more benefits than improving accuracy and efficiency. Sklavos *et al.* (2024) opined that AI technologies enable ESG performance to be tracked in real-time, keeping stakeholders updated with a business's sustainability programs in a timely fashion. With machine learning algorithms, AI systems can forecast potential sustainability risks, like environmental liabilities or failure in governance, before their actual materialization. This feature provides businesses with a forward-looking strategy in sustainability management, mitigating risks and improving long-term financial performance. AI can facilitate better decision-making with functionality to correlate businesses' ESG strategies with investor expectations and regulatory pressures. While there are positive expectations for AI in sustainability reporting, several barriers exist to prevent adoption, as discussed in a later section of this paper.

The aim of this paper is to address AI-based predictive analytics in sustainability reporting from a consideration of three research questions. Firstly, this paper considers

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how AI-based technologies improve accuracy, efficiency, and reliability in sustainability disclosures. Secondly, this paper considers the challenges and benefits of using AI in sustainability reporting. Thirdly, it considers significant trends in AI-based sustainability reporting. The outcomes will form the background for future research and policy guidelines for enhancing AI integration in sustainability reporting frameworks.

LITERATURE REVIEW

Sustainability reporting trends and challenges

Over time, sustainability reporting has evolved as companies increasingly see disclosure of environmental, social, and governance (ESG) information as important. With increased pressure for disclosure from investors, regulators, and other stakeholders, companies have adopted sustainability reporting guidelines. This segment examines how reporting guidelines for sustainability have evolved, what challenges companies are facing, and what new developments in regulations are shaping corporate disclosure.

Evolution of Standards

Sustainability reporting guidelines have evolved greatly over the past few decades. At the beginning, companies reported on sustainability information on a voluntary basis, usually in reaction to stakeholder pressure and not due to regulations (Elda, 2024). With greater awareness of ESG factors, however, frameworks like the Global Reporting Initiative (GRI), International Financial Reporting Standards (IFRS) Sustainability Standards, and Sustainability Accounting Standards Board (SASB) have developed to give companies structured frameworks to apply in their disclosures (GRI, 2023; IFRS Foundation, 2024). Among the first frameworks to gain international recognition was the Global Reporting Initiative (GRI). Established in 1997, GRI provides companies with guidelines to report ESG-related information in a consistent and comparable way across sectors. GRI guidelines are applied extensively globally and encourage stakeholder inclusiveness in reporting on sustainability (GRI, 2023).

The Sustainability Accounting Standards Board (SASB) was founded in 2011 to define industry-specific sustainability disclosure guidelines. SASB is focused on financially material sustainability issues that have an influence on enterprise value and is hence most applicable to investors (SASB, 2024). While GRI has a stakeholder approach with a broad scope, SASB is designed to incorporate sustainability reporting into financial reporting. IFRS Sustainability Standards, published by the International Sustainability Standards Board (ISSB), is a more recent endeavor to align ESG reporting with financial reporting. The ISSB was established in 2021 in an attempt to create a global standard for sustainability disclosures. These guidelines are designed to provide investors with comparable and consistent sustainability-related information in a financial context (IFRS

Foundation, 2024).

Despite such frameworks being in place, reporting variations between jurisdictions have led to inconsistencies in sustainability disclosures (Segal, 2022). Many companies are in a dilemma regarding what framework to apply, and therefore, reporting is inconsistent. Additionally, in certain countries, a lack of obligatory reporting regulations for sustainability has meant that disclosures are inconsistent or partial (Feeney, 2024).

Reporting Challenges

Despite its increased popularity, sustainability reporting is still a challenging endeavor for companies. These range from greenwashing and data reliability concerns to integrating non-financial measures into conventional financial reports.

Greenwashing

Greenwashing is a condition in which companies provide untrue or exaggerated sustainability data to appear more environmentally friendly than they are. Greenwashing undermines the credibility of sustainability reports and prevents investors and stakeholders from being able to assess a company's real ESG performance (Moodaley & Telukdarie, 2023). AI has been suggested as a way to detect greenwashing, but there are issues due to ESG data complexity and tampering with AI models (Janice & Delina, 2024). Some companies apply selective disclosure, reporting good sustainability performance and leaving out negative information. This is a partial account of ESG performance and reduces transparency. Standardized reporting can address this issue, but enforcement is difficult (Sætra, 2021).

Data Accuracy and Reliability

Another important challenge is ESG data accuracy and reliability. Financial data is governed by established accounting principles, but ESG data does not have standard measurement frameworks. Multiple sources give companies sustainability data, and verification is problematic (Ahmad *et al.*, 2023). AI has been used to improve ESG data accuracy, but data bias and algorithmic errors still occur (Aldemir & Uysal, 2025). AI-based sustainability reporting is only effective with good data. Poor data quality will lead to erroneous conclusions and affect investment decisions (Zhang & Yang, 2024). Even companies employing third-party ESG rating agencies experience inconsistencies since different agencies will apply different measures to evaluate sustainability performance (Sariyer *et al.*, 2024).

Integration of Non-Financial Metrics

Integrating ESG measures with financial reporting is a difficult process. Many companies struggle to connect ESG performance with financial performance in a helpful way (Peng *et al.*, 2023). Financial reports focus on quantifiable measures for finance, and sustainability

reporting has qualitative disclosures. Bridging this gap requires new methodologies and reporting tools. AI-based reporting systems have been developed to assist in ESG performance measurement and accuracy in disclosure. Their adoption is low, mostly in developing economies where companies lack the proper technical capabilities and resources to apply AI-based reporting systems (Khoruzhy *et al.*, 2022).

Regulatory Developments

Regulatory bodies and governments around the world are implementing new rules to promote greater transparency and credibility in sustainability reporting. New trends indicate a shift towards making ESG disclosures compulsory and introducing stricter reporting requirements.

European Union's Corporate Sustainability Reporting Directive (CSRD)

The 2022 European Union Corporate Sustainability Reporting Directive (CSRD) requires firms to provide extensive sustainability disclosures. It raises the number of firms to report to approximately 49,000 in line with ESG and has stronger data assurance obligations (European Commission, 2024). Under the CSRD, firms will be required to report in line with the European Sustainability Reporting Standards (ESRS) to enable a high level of comparability across sectors.

United States SEC Climate Disclosure Rules

The U.S. Securities and Exchange Commission (SEC) has issued new rules that will require public companies to include climate-related risks and greenhouse gas emissions in their financial statements. The rules will enhance investor confidence as companies will be providing consistent and transparent ESG disclosures (US EPA, 2024). However, the rules have been opposed by some business groups on the grounds that following them will be expensive (Burnaev *et al.*, 2023).

IFRS Sustainability Standards and Worldwide Acceptance

IFRS Sustainability Standards are being adopted all around the world, with many countries considering whether to do so. IFRS Sustainability Standards aim to create a single global framework for reporting on sustainability to avoid differences in reporting frameworks. Complete adoption globally is doubtful, with some jurisdictions deciding to maintain their own ESG reporting guidelines (IFRS Foundation, 2024).

Challenges in Implementing Regulations

Despite progress in ESG regulation, there are several challenges. One is a lack of consistency in regulation in different jurisdictions. While jurisdictions such as the European Union have set stringent reporting rules for sustainability, some other jurisdictions have opted for a voluntary approach. This is a challenge for multinationals

to standardize ESG disclosures (Riyath & Jariya, 2024). Another issue is enhancing enforcement. With or without obligatory sustainability reporting, enforcement is a challenge. Some companies will try to use ESG disclosures to appease regulators instead of actually changing their sustainability behavior (Ren *et al.*, 2025). AI has been used to enhance fraud prevention and good governance, but algorithmic bias and ethical issues remain present (Aldemir & Uysal, 2025).

Future Outlook

Technological innovation, more stringent regulations, and increased stakeholder expectations will shape future sustainability reporting. AI and big data analytics will be critical drivers in making ESG reporting more efficient and accurate. Data privacy, cybersecurity, and being compliant with regulations are issues that will have to be tackled (Tariq & Rahim, 2024). With regulations changing, firms will have to enhance processes for sustainability reporting to meet new disclosure demands. Additional transparency and accountability will be required to build investor confidence and allow sustainability reporting to bring about real corporate transformation.

MATERIALS AND METHODS

The research employs a systematic literature review (SLR) to investigate AI-based predictive analytics in sustainability reporting (Gotoman *et al.*, 2025). SLR is a transparent and systematic way to develop a balanced and exhaustive synthesis of available research (Almeida & Bálint, 2024). SLR is a proper research technique for emergent interdisciplinary research themes as it enables the building of patterns, gaps, and future research focus (Sundarakani & Ghouse, 2024).

Search Strategy

The literature was searched in a variety of academic databases (Scopus, Web of Science, IEEE Xplore, and Google Scholar) to provide a rich diversity of relevant research. They were selected for their extensive coverage of peer-reviewed journals and conference proceedings in fields relevant to artificial intelligence, sustainability, and accounting reporting (Mienye *et al.*, 2024).

A keyword and Boolean operator set was used to create search strings. The keywords used included “artificial intelligence,” “predictive analytics,” “sustainability reporting,” “ESG reporting,” and “financial reporting.” They were searched in article title, abstract, and keywords. For instance, a sample search query was: (“artificial intelligence” OR “predictive analytics”) AND (“sustainability reporting” OR “ESG reporting” OR “financial reporting”). Articles published between 2016 and 2025 in English were searched to locate recent and relevant research.

Inclusion and Exclusion Criteria

Inclusion and exclusion criteria were established specifically

to give relevance and quality to included studies.

Inclusion Criteria

Peer reviewed journal articles and conference papers.
 Research on AI or predictive analytics for use in sustainability, ESG, or finance reporting.
 Articles published between 2016 and 2025
 Publications in English.

Exclusion Criteria

Research that is not AI or predictive analytics.
 Articles unrelated to reporting on sustainability, ESG, or finance.
 Non-peer reviewed publications like opinion articles, editorials, and book reviews.
 Books published in foreign languages.

Screening and Selection Process

The screening and selection process was carried out

in line with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher *et al.*, 2009). This was a four-step process that included identification, screening, eligibility, and inclusion.

Identification: 1,087 articles from selected databases were obtained from the initial search.

Screening: 873 articles remained after removing duplicates. Titles and abstracts of those articles were screened for relevance, and 672 articles that were not in conformity with inclusion criteria were excluded.

Eligibility: All 201 full texts were screened for eligibility. A total of 162 articles were excluded in this stage for not focusing on using AI for sustainability reporting or for being methodologically weak.

Inclusion: Lastly, 39 articles were selected and included in qualitative synthesis. A PRISMA flow diagram explaining this process is shown in Figure 1.

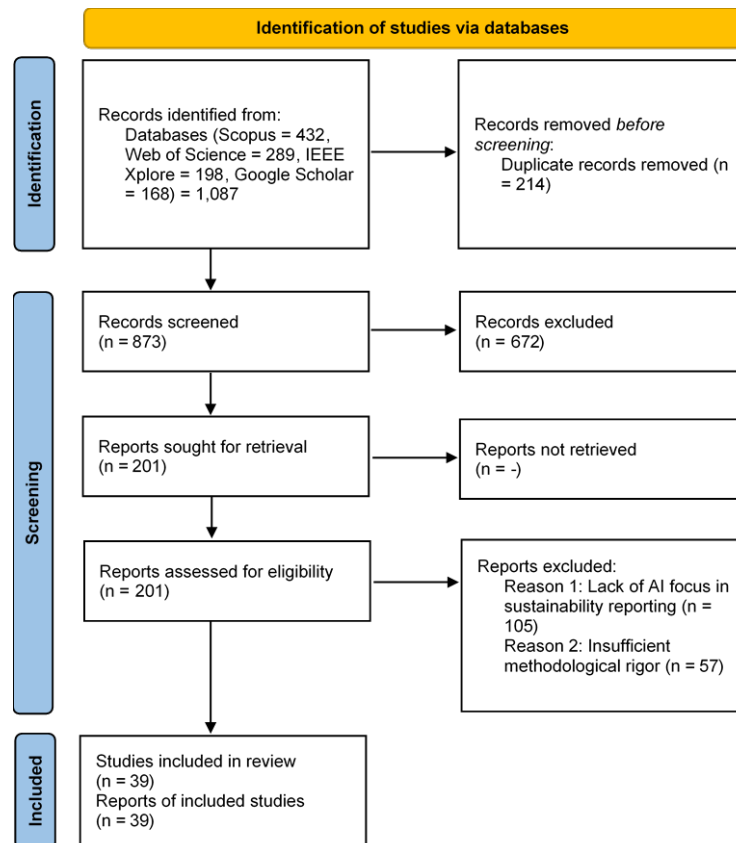


Figure 1: PRISMA flow diagram

Data Extraction and Thematic Analysis

Systematic data extraction was carried out to extract relevant information from all studies included. A standard data extraction form was used, recording information such as author(s), publication year, research purpose(s), methodologies, and key findings. This ensured consistency and allowed for comparative evaluation between studies. The process was conducted following Braun and Clarke’s (2022) guidelines in a sequence from familiarization with data to initial

code generation, searching for themes, reviewing themes, defining and labeling themes, and producing a report. This structured analytical process enabled an identification of salient trends, issues, and literature gaps in incorporating AI-based predictive analytics in sustainability reporting. The outcomes of this thematic analysis are discussed in detail in subsequent sections of this paper. Table 1 provides an overview of selected articles and a summary of reviewed articles, focusing on their objectives, AI method, and findings.

Table 1: Summary of Selected Articles

Authors (Date)	Title	Source (Journal)	AI Method Used	Key Findings
Zhang and Yang (2024)	Artificial Intelligence and Corporate ESG Performance	International Review of Economics & Finance	Natural Language Processing (NLP), AI-related patent data	AI adoption significantly enhances environmental and social performance, with limited impact on governance. Firms with strong absorptive capacity benefit more. AI aids environmental monitoring, resource optimization, and carbon tracking.
Tariq and Rahim (2024)	Role of Artificial Intelligence in Enhancing Sustainability Reporting and Green Accounting in Industry 4.0	Acta Marisiensis Seria Technologica	AI-driven automation and data analytics	AI enhances real-time monitoring, data-driven decision-making, and resource utilization. It improves transparency and accountability in sustainability reporting.
Oyeniya <i>et al.</i> (2024)	The Influence of AI on Financial Reporting Quality: A Critical Review and Analysis	World Journal of Advanced Research and Reviews	AI-based analytics in financial reporting	AI improves accuracy, efficiency, and timeliness in financial reporting but raises concerns about ethics, biases, and regulatory compliance.
Al-Blooshi and Nobanee (2020)	Applications of Artificial Intelligence in Financial Management Decisions: A Mini-Review	SSRN Electronic Journal	AI-driven financial analytics, anomaly detection, algorithmic trading	AI optimizes investment strategies, detects financial anomalies, and automates trading. However, risks related to governance and oversight must be addressed.
Johri (2025)	Impact of AI on Performance and Quality of Accounting Information Systems and Financial Reporting	Accounting Forum	AI-driven internal control systems & quality assurance	AI improves the relevance, accuracy, variability, and timeliness of financial data reporting. It positively influences internal controls and overall reporting quality.
Riyath and Jariya (2024)	The Role of ESG Reporting, Artificial Intelligence, Stakeholders and Innovation Performance in Fostering Sustainability Culture and Climate Resilience	Journal of Financial Reporting and Accounting	AI for ESG reporting & sustainability analytics	AI enhances ESG reporting and sustainability awareness. Stakeholder engagement and AI-driven insights improve climate resilience and corporate innovation.
Khoruzhy <i>et al.</i> (2022)	ESG Investing in the AI Era: Features of Developed and Developing Countries	Frontiers in Environmental Science	Regression analysis, economic modeling, SWOT analysis	AI enhances ESG investments, but adoption varies by country due to ICT, R&D, and financial resources. Institutional barriers affect implementation.
Ozkan (2024)	The Transformative Impact of AI on CSR, ESG, and Sustainability: Critical Review and Case Studies	International Finance Review	Machine Learning (ML), ChatGPT-4	AI enhances sustainability reporting efficiency and ethical business practices but raises ethical concerns.

Moodaley and Telukdarie (2023)	Greenwashing, Sustainability Reporting, and Artificial Intelligence: A Systematic Literature Review	Sustainability	AI text analysis, bibliometric and thematic analysis	AI can detect greenwashing in sustainability reports, but research in this area is still underdeveloped.
Peng <i>et al.</i> (2023)	Riding the Waves of AI in Advancing Accounting and Its Implications for SDGs	Sustainability	Data analytics, automation, algorithms	AI enhances efficiency, accuracy, and decision-making in financial reporting, contributing to multiple SDGs.
Sklavos <i>et al.</i> (2024)	ESG-Based AI Governance: Digitalizing Firms' Leadership and HRM	Sustainability	Bibliometric analysis (VOSviewer, Biblioshiny)	AI in ESG governance improves decision-making but raises transparency and cybersecurity concerns.
Anton <i>et al.</i> (2024)	Using Chatbots to Enhance Integrated Reporting	Electronics	Chatbots, Python's Seaborn library	Chatbots improve reporting efficiency, accuracy, and stakeholder communication.
Wang <i>et al.</i> (2024)	The Functional Mechanisms through Which Artificial Intelligence Influences the Innovation of Green Processes of Enterprises	Systems	Not specified	AI positively influences green process innovation in enterprises, with intellectual capital moderating the effect.
Reslan and Al Maalouf (2024)	Assessing the Transformative Impact of AI Adoption on Efficiency, Fraud Detection, and Skill Dynamics in Accounting Practices	Journal of Risk and Financial Management	Not specified	AI enhances data efficiency, fraud detection, and alters skill requirements in accounting.
Burnaev <i>et al.</i> (2023)	Practical AI Cases for Solving ESG Challenges	Sustainability	Various AI techniques (prediction, optimization, classification/ clustering)	AI aids ESG initiatives but also poses risks like fake news generation and high energy consumption.
Sariyer <i>et al.</i> (2024)	Predictive and prescriptive analytics for ESG performance evaluation: A case of Fortune 500 companies	Journal of Business Research	Clustering, association rule mining, deep learning, prescriptive analytics	AI-driven ESG performance models help decision-makers optimize sustainability strategies.
Ertz <i>et al.</i> (2024)	The impact of Big Data Analytics on firm sustainable performance	Corporate Social Responsibility and Environmental Management	Predictive and prescriptive analytics	BDA positively impacts economic, social, and environmental performance, with prescriptive analytics outperforming predictive analytics.

Ahmad <i>et al.</i> (2023)	The Impact of AI on Sustainability Reporting in Accounting	2023 6th International Conference on Contemporary Computing and Informatics (IC3I)	AI, Blockchain, Big Data, RPA	AI enhances ESG data collection, trend identification, and real-time insights.
Chang <i>et al.</i> (2023)	Applying sustainable development goals in financial forecasting using machine learning techniques	Corporate Social Responsibility and Environmental Management	Machine Learning (Artificial Neural Network)	SDGs adoption improves earnings per share (EPS) prediction and stakeholder engagement.
Sætra (2021)	A Framework for Evaluating and Disclosing the ESG Related Impacts of AI with the SDGs	Sustainability	Not specified	Existing ESG frameworks fail to capture AI's sustainability impact; proposes new SDG-based disclosure framework.
van der Heever <i>et al.</i> (2024)	Understanding Public Opinion towards ESG and Green Finance with the Use of Explainable Artificial Intelligence	Mathematics	Explainable AI (XAI), SenticNet API, LIME, SHAP	AI reveals public sentiment towards ESG, offering a more transparent approach to ESG evaluation.
Shahloob (2025)	ESG Disclosure and Financial Performance: Survey Evidence from Accounting and Islamic Finance	Sustainability	Not specified	ESG disclosure perceived to enhance financial performance, trust, and investment attractiveness.
Gînguță <i>et al.</i> (2023)	Ethical Impacts, Risks and Challenges of Artificial Intelligence Technologies in Business Consulting	Electronics	Structural Equation Modeling (SEM)	Ethical concerns (e.g., discrimination, privacy) negatively impact AI adoption in consulting.
Pattnaik <i>et al.</i> (2024)	Applications of artificial intelligence and machine learning in the financial services industry: A bibliometric review	Heliyon	Not specified	Identifies key AI/ML applications in BFSI and future research directions.
Ren <i>et al.</i> (2025)	The impact of artificial intelligence on corporate greenwashing: evidence from the Chinese listed firms	Journal of Accounting Literature	AI penetration rate analysis, fixed-effects model	AI inhibits greenwashing, especially in state-owned firms and those with strong social scrutiny. AI enhances corporate environmental performance.
Zhang (2024)	The pathway to curb greenwashing in sustainable growth: The role of artificial intelligence	Energy Economics	AI-enhanced ESG rating analysis, panel data regression	AI significantly reduces greenwashing by improving ESG rating disclosure quality, particularly in SOEs and high-regulation areas.

Janice and Delina (2024)	Potentials and challenges of artificial intelligence-supported greenwashing detection in the energy sector	Energy Research & Social Science	AI-driven greenwashing detection	AI can enhance greenwashing detection but faces challenges like data limitations and algorithm transparency.
Balcioglu <i>et al.</i> (2024)	Artificial Intelligence Integration in Sustainable Business Practices: A Text Mining Analysis of USA Firms	Sustainability	Text Mining	AI enhances operational efficiency, environmental sustainability, and social responsibility through predictive maintenance, energy optimization, and bias-free HR management.
Bin-Nashwan <i>et al.</i> (2024)	Does AI adoption redefine financial reporting accuracy, auditing efficiency, and information asymmetry?	Computers in Human Behavior Reports	AI-driven systems, Big Data Governance	AI adoption improves financial reporting accuracy and auditing efficiency while reducing information asymmetry, influenced by top management support and innovation climate.
Alz eghoul and Alsharari (2024)	Impact of AI Disclosure on the Financial Reporting and Performance as Evidence from US Banks	Journal of Risk and Financial Management	AI Disclosure Analysis	AI disclosure improves financial reporting and performance, but the extent depends on shareholder and board interactions. Large shareholders push for more AI disclosure.
Aldemir and Uysal (2025)	Artificial Intelligence for Financial Accountability and Governance in the Public Sector	Administrative Sciences	Predictive Analytics, Fraud Detection, Automated Reporting	AI improves efficiency, transparency, and decision-making but faces challenges like algorithmic bias, data privacy, and ethical concerns.
Shiyyab <i>et al.</i> (2023)	The Impact of Artificial Intelligence Disclosure on Financial Performance	International Journal of Financial Studies	Content Analysis	AI disclosure has a positive effect on financial performance (ROA, ROE) and a negative effect on total expenses, but disclosure levels remain weak in some Jordanian banks.
Artene <i>et al.</i> (2024)	Unlocking Business Value: Integrating AI-Driven Decision-Making in Financial Reporting Systems	Electronics	Neural Networks, Game Theory	AI optimizes profitability and efficiency in financial reporting. Game theory helps analyze financial strategy. Data quality and regulatory challenges remain.
König <i>et al.</i> (2023)	Sustainability Challenges of Artificial Intelligence and Citizens' Regulatory Preferences	Government Information Quarterly	Survey Analysis	Citizens prefer soft regulation (incentives, labels) over hard regulation. Trust in tech firms and policymakers' competence influences regulation preferences.
Sipola <i>et al.</i> (2023)	Adopting Artificial Intelligence in Sustainable Business	Journal of Cleaner Production	Qualitative Content Analysis	AI supports social, ecological, and societal sustainability, improving efficiency and governance. Challenges include ethical concerns and job displacement.
Dhiman <i>et al.</i> (2024)	Artificial Intelligence and Sustainability—A Review	Analytics	Literature Review	AI can drive sustainability, but concerns over energy consumption, ethics, and bias persist.

Liu <i>et al.</i> (2024)	AI-Driven Financial Analysis: Exploring ChatGPT's Capabilities and Challenges	International Journal of Financial Studies	ChatGPT-4o	ChatGPT-4o demonstrates strong financial reasoning but struggles with deep analytical tasks; human oversight is needed.
Bulău <i>et al.</i> (2024)	Can AI Become an Active Assistant to Finance, Audit, and Accounting?	Acta Universitatis Danubius	ChatGPT bot – Finance Wizard	AI can reliably assist with financial analysis and repetitive tasks but requires human validation for strategic decisions.
Karger and Kureljusic (2023)	Forecasting in Financial Accounting with AI – A Systematic Literature Review	Journal of Applied Accounting Research	Machine Learning, Deep Learning	AI forecasting models are underutilized in financial accounting, requiring more generalizable and systematic knowledge.

Table 2: Thematic Categorization of Literature

Theme	Research Question (RQ)	Articles Supporting It	Key Insights
AI-powered predictive analytics in ESG and financial reporting	RQ1: How is AI-powered predictive analytics used in sustainability-focused financial reporting?	Zhang & Yang (2024), Riyath & Jariya (2024), Khoruzhy <i>et al.</i> (2022), Ozkan (2024), Sariyer <i>et al.</i> (2024), Ertz <i>et al.</i> (2024), Bin-Nashwan <i>et al.</i> (2024), Aldemir & Uysal (2025), Artene <i>et al.</i> (2024), Karger & Kureljusic (2023), Chang <i>et al.</i> (2023)	AI enhances ESG and financial reporting through improved accuracy, investment decision-making, risk prediction, and fraud detection. Machine learning and neural networks optimize profitability and efficiency but face adoption challenges.
AI applications in sustainability and financial reporting	RQ1	Tariq & Rahim (2024), Oyeniyi <i>et al.</i> (2024), Ahmad <i>et al.</i> (2023), Peng <i>et al.</i> (2023), Anton <i>et al.</i> (2024)	AI automates ESG reporting, enhances financial accuracy, and ensures compliance, increasing transparency and efficiency.
AI's role in detecting greenwashing	RQ1	Moodaley & Telukdarie (2023), Ren <i>et al.</i> (2025), Zhang (2024), Janice & Delina (2024)	AI detects false sustainability claims, improving ESG disclosure quality, but the field requires further research.
Challenges and benefits of AI in sustainability and financial reporting	RQ2: What are the challenges and benefits of using AI in sustainability reporting?	Riyath & Jariya (2024), Tariq & Rahim (2024), Oyeniyi <i>et al.</i> (2024), Al-Blooshi & Nobanee (2020), Ozkan (2024), Sklavos <i>et al.</i> (2024), Burnaev <i>et al.</i> (2023), Wang <i>et al.</i> (2024), Janice & Delina (2024), Bin-Nashwan <i>et al.</i> (2024), Aldemir & Uysal (2025), Balcioğlu <i>et al.</i> (2024), Alzaghoul & Alsharari (2024), Sipola <i>et al.</i> (2023), Dhiman <i>et al.</i> (2024), König <i>et al.</i> (2023), Liu <i>et al.</i> (2024), Bulău <i>et al.</i> (2024)	AI fosters sustainability culture and operational efficiency but raises challenges such as algorithmic bias, cybersecurity risks, data privacy concerns, regulatory hurdles, misinformation risks, and ethical issues.
Ethical and regulatory concerns in AI-driven sustainability reporting	RQ2	Gînguță <i>et al.</i> (2023), Sætra (2021), Shalhoob (2025)	AI in sustainability reporting faces ethical dilemmas, including privacy concerns, potential discrimination, and regulatory misalignment with ESG frameworks.

Trends in AI-driven sustainability and financial reporting	RQ3: What are the key trends in AI-driven sustainability reporting?	Johri (2025), Tariq & Rahim (2024), Zhang & Yang (2024), Burnaev <i>et al.</i> (2023), Sariyer <i>et al.</i> (2024), Balcioglu <i>et al.</i> (2024), Dhiman <i>et al.</i> (2024), Sipola <i>et al.</i> (2023), Karger & Kureljusic (2023), van der Heever <i>et al.</i> (2024), Ren <i>et al.</i> (2025), Zhang (2024)	AI is increasingly used for predictive maintenance, ESG sentiment analysis, smart energy management, blockchain integration, and emissions monitoring. However, ethical concerns and the need for improved models remain challenges.
AI's impact on corporate environmental performance	RQ3	Ren <i>et al.</i> (2025), Zhang (2024)	AI enhances corporate environmental responsibility, particularly in state-owned enterprises and firms under strict regulations.
AI in financial forecasting for sustainability	RQ1	Chang <i>et al.</i> (2023)	Machine learning (e.g., artificial neural networks) improves earnings per share (EPS) prediction by incorporating SDG variables.

RESULTS AND DISCUSSIONS

Financial reporting, ESG (Environmental, Social, and Governance) disclosures, and corporate accountability have all been highly influenced by artificial intelligence (AI). The articles selected in Table 1 highlight how AI technologies, such as natural language processing (NLP), predictive analytics, and machine learning, enhance corporate sustainability, financial transparency, and good corporate governance. Table 2 further decomposes these findings into overarching research themes, examining applications, benefits, and limitations in employing AI in finance and sustainability reporting. This paper synthesises a variety of literature to outline how AI influences ESG disclosures, financial performance and greenwashing and how it addresses issues such as ethical concerns and obstacles to regulation.

AI in ESG reporting and sustainability performance

Numerous studies indicate AI's role in revolutionizing ESG reporting and sustainability performance. Zhang and Yang (2024) determined that AI has a positive influence on social and environmental performance in that it optimises resources, protects against environmental degradation, and monitors carbon. AI's role in corporate governance is in its nascent stage. Tariq and Rahim (2024) discussed AI's role in reporting automation on sustainability, real-time monitoring, and decision-making with data. AI ESG reporting is supplemented with Riyath and Jariya (2024), who believe AI builds climate resilience and corporate innovation with stakeholder engagement and sustainability analytics. AI's application in ESG investments is varied in different countries, as seen in Khoruzhy *et al.* (2022). Their research concluded that ICT infrastructural capabilities, R&D capabilities, and access to finance influence AI adoption in developed and developing countries. Ozkan (2024) further established AI as a driver for ethical business behavior, enhancing efficiency in

sustainability reporting and raising alarms for potential ethical risks. Ertz *et al.* (2024) corroborated this in that AI-based big data analytics (BDA) positively influences economic, social, and environmental performance in companies, with prescriptive analytics being more effective than predictive analytics in sustainability strategy. AI's predictive power in ESG performance measurement was further explored in Sariyer *et al.* (2024) with cluster and deep learning algorithms to optimize sustainability strategies for Fortune 500 companies. Aldemir and Uysal (2025) went on to show in turn how AI-based predictive analytics improve transparency, fraud detection, and decision-making in public sector finance accountability and government. All these studies collectively place AI as a powerful tool for ESG reporting accuracy, investment decision-making, and corporate sustainability performance.

Accuracy in Financial Reporting and AI

The application of AI in accounting is a timely topic. AI finance analytics, as discussed in AI-Blooshi and Nobanee (2020), enhance investment choices, detect financial anomalies, and automate trading. However, studies are cautious and cite control and management risks. AI complements accounting information systems and internal control, as noted in Johri (2025), who proved that AI-based internal control systems improve relevance, accuracy, and timely reporting in finance. AI's role in financial reporting is supplemented in Oyeniyi, Ugochukwu, and Mhlongo (2024) with a statement that AI optimizes accuracy, efficiency, and timely reporting in financial reporting and raises ethical issues in terms of bias and regulation. Similarly, Ahmad *et al.* (2023) documented AI's role in accounting sustainability reporting, describing how AI-supported technologies such as blockchain, robotic process automation (RPA), and big data improve ESG data collection and trend identification. Peng *et al.* (2023) explored AI's role in

making finance reporting effective to aid in a range of Sustainable Development Goals (SDGs).

Anton *et al.* (2024) explored chatbot use in integrated reporting and concluded that chatbots improve reporting accuracy, efficiency, and stakeholder communication. Bin-Nashwan *et al.* (2024) found increased use of AI-based reporting with a report that AI usage improves accuracy in reporting, audit efficiency, and information asymmetry. Their paper reported that such improvements are, however, dependent on top management support and an innovation climate in an organization. Artene *et al.* (2024) went a step further and incorporated game theory and neural networks in financial reporting systems, with a demonstration that AI optimizes profitability and efficiency. Data quality and regulation problems, however, still present challenges. Karger and Kureljusic (2023) reported similar problems with AI-based forecasting for financial accounting, noting that AI-based forecasting models are underutilized and that more systematic knowledge-building is required.

AI's Role in Greenwashing Detection

AI has emerged as a valuable resource in detecting greenwashing, where companies falsely present themselves as being sustainable in an attempt to enhance their corporate brand. Moodaley and Telukdarie (2023) conducted a systematic literature review on AI-based greenwashing detection and concluded that AI text analytics and bibliometrics can pick out misrepresentative assertions of sustainability. However, according to the study, research in this area is still in its infancy. Ren *et al.* (2025) explored AI in reducing corporate greenwashing in Chinese listed firms and concluded that AI penetration deters greenwashing, particularly in state-owned firms (SOEs) and firms with high social scrutiny. Similarly, Zhang (2024) found that AI enhances ESG rating disclosure quality, significantly reducing greenwashing, particularly in highly regulated settings. Janice and Delina (2024) explored AI's potential to detect greenwashing in the energy sector and determined that AI can enhance corporate transparency. However, algorithmic transparency, data limitations, and regulatory barriers are present. These findings show that AI is a viable solution to reducing corporate misinformation in sustainability reporting.

AI Disclosure and Financial Performance

The impact of AI disclosure on financial performance has been thoroughly investigated. Shiyab *et al.* (2023) concluded that AI disclosure has a positive effect on financial performance measures such as return on assets (ROA) and return on equity (ROE), and reduces total cost. AI disclosure levels in some Jordanian banks are still low, however, which indicates a lack of AI adoption. Alzghoul and Alsharari (2024) investigated AI disclosure's effect on US banks' financial reporting and concluded that AI disclosure has a positive effect on improving financial performance and transparency.

The research noted that to what extent such gains are realized is a function of shareholders' control and board interactions and that large shareholders need more AI disclosure. Balcioğlu, Çelik, and Altındağ (2024) carried out text mining research on US firms and established that AI enhances operating efficiency, environmental sustainability, and social responsibility. AI use for predictive maintenance, energy optimization, and bias-free management of human resources was emphasized in research as drivers for improving corporate performance.

AI Implementation Challenges and Ethical Concerns

Although AI has numerous benefits, there are several challenges. Ethical concerns in AI adoption were reported by Ginguță *et al.* (2023) to have a detrimental influence on AI adoption in business consulting owing to issues such as discrimination and privacy. König *et al.* (2023) investigated public sentiment towards AI regulation and established that citizens prefer measures for soft regulation in the form of incentive and transparency labeling as opposed to hard regulations. Sipola *et al.* (2023) discussed AI adoption in sustainable business and noted problems such as job loss and ethics. Similarly, Dhiman *et al.* (2024) systematically reviewed AI in sustainability and noted energy consumption, ethics, and bias to still be major concerns. Aldemir and Uysal (2025) went on to research AI in finance and accountability and concluded that AI increases efficiency and transparency but is hampered by algorithmic bias and data privacy. Liu *et al.* (2024) investigated AI finance analysis using ChatGPT-4o and concluded that while AI possesses sound finance rationale ability, it is short on ability in in-depth analytics and hence requires supervision from humans.

Case Studies of the Application of AI in Financial Reporting

Artificial Intelligence (AI) is transforming how companies manage Environmental, Social, and Governance (ESG) data collection, reporting, and sustainability programs. Two of these instances are discussed in this study.

EnerSys's AI Integration

EnerSys, a leading industrial battery manufacturer and energy storage company in the United States, has adopted AI to improve data collection and reporting for sustainability. EnerSys utilizes a tool called ESG Flo, which applies heat map-based machine learning to extract valuable information from 180 locations globally. This AI system improves accuracy, auditability, and efficiency in collecting Scope 1 and Scope 2 emissions information. Site representatives send a PDF copy of their bill, and AI processes this to extract information such as range, usage quantity, cost, and unit of measurement. AI flags anomalies and variabilities and assists in making data traceable and auditable (Runyon, 2024). Aside from

data extraction, EnerSys is piloting ESG Flo’s system for compliance, with project management capabilities supplemented with AI to aid in future ESG regulations and disclosure rules. AI is being used in ESG Flo’s system to auto-fill answers to similar disclosure questions in several ESG frameworks, cutting down on time and effort. EnerSys is using ChatGPT Enterprise to process large datasets for sustainability data like emissions and waste (Runyon, 2024). This AI-powered generative tool recognizes insights quicker than a manual method and helps in replying to customer questionnaires and surveys on their sustainability processes in an efficient manner.

Regrow’s AI-powered Platform

Regrow is a 2016 ag-tech business that is focused on regenerative agriculture and has developed the Sustainability Insights platform. This uses machine learning, satellite imagery, and soil modeling to track and manage agricultural supply chains’ carbon footprint. It allows for large-scale aggregation, crucial to improving food industry sustainability, which has previously relied on outdated data methods. Large food firms like PepsiCo, General Mills, Kellanova, and Cargill are collaborating with Regrow to encourage climate-friendly agriculture (Balch, 2024). Regrow’s software enables companies to conduct robust Scope 3 accounting, create investable carbon reduction and removal strategies, and track on-farm progress over time (Achard, 2024). Using remote sensing, machine learning, and industry-leading soil modeling, Regrow enables IPCC Tier 3 level measurement without having to conduct time-consuming supplier surveys, reducing

time to action and reducing program cost. Enrolling growers, monitoring practice adoption, and reporting program outcomes with confidence to create carbon credits or verify emissions reductions are all facilitated on the platform (Regrow, 2024).

Implications and Future Outlook

The application of AI in ESG data collection and reporting, demonstrated in EnerSys and Regrow, has several benefits:

Greater Efficiency: AI analyzes and processes data, reducing the requirement for human intervention and decreasing error likelihood.

Greater Accuracy: Large data sets can be processed accurately with machine learning algorithms, yielding consistent data for reporting and decision-making.

Scalability: AI systems can handle large volumes of data from several locations or supply chains and hence are best for large-sized firms.

Regulatory Compliance: AI can be utilized to handle complex ESG regulations via automation and timely reporting.

With ESG considerations increasingly influencing business operations, the adoption of AI technologies will inevitably increase. Those companies that integrate AI into their ESG strategies will be in a position to gain a competitive advantage through improving sustainability performance, complying with regulations, and enhancing stakeholder confidence.

AI Techniques Used in Sustainability Reporting

The table below shows the various AI techniques

Table 3: AI Techniques Used in Sustainability Reporting

AI Technique	Definition	Application in Sustainability Reporting	Example Papers
Natural Language Processing (NLP) & AI Text Analysis	AI-driven text analysis to extract insights from sustainability reports	Analyzes ESG disclosures for compliance, trends, and sentiment analysis; detects greenwashing in sustainability disclosures	Zhang & Yang (2024); Moodaley & Telukdarie (2023)
Machine Learning (ML) & Artificial Neural Networks (ANN)	AI algorithms that learn patterns from data to improve predictions	Enhances sustainability reporting, detects risks, predicts ESG performance, and improves decision-making	Tariq & Rahim (2024); Johri (2025); Ozkan (2024); Chang <i>et al.</i> (2023)
Predictive & Prescriptive Analytics	Uses historical data to forecast and provide recommendations	Predicts ESG ratings, corporate sustainability trends, and financial risks while recommending best sustainability strategies	Johri (2025); Zhang & Yang (2024); Sariyer <i>et al.</i> (2024); Ertz <i>et al.</i> (2024)
AI-powered Risk & Financial Analytics	AI models that assess financial risks and governance issues	Detects anomalies, predicts financial distress, and analyzes sustainability risks	Oyeniyi <i>et al.</i> (2024)
AI-driven Automation & Data Analytics	AI-driven tools for financial and ESG data processing	Automates sustainability data collection, enhances reporting efficiency, and reduces manual errors	Tariq & Rahim (2024); Riyath & Jariya (2024); Peng <i>et al.</i> (2023)

Regression Analysis & Economic Modeling	Statistical techniques for analyzing relationships between variables	Examines ESG investment patterns and AI's impact on financial decisions	Khoruzhy <i>et al.</i> (2022)
Optimization & Clustering	AI techniques for grouping data and efficient resource allocation	Identifies ESG reporting patterns across firms and optimizes sustainability strategies	Wang <i>et al.</i> (2024); Burnaev <i>et al.</i> (2023); Sariyer <i>et al.</i> (2024)
Association Rule Mining	Finds relationships between variables	Helps uncover ESG data correlations	Sariyer <i>et al.</i> (2024)
Explainable AI (XAI)	AI models with interpretable decision-making	Sentiment analysis of ESG topics using LIME, SHAP, and SenticNet	van der Heever <i>et al.</i> (2024)
Blockchain & Big Data	Distributed ledger and large-scale data analytics	Enhances ESG data collection and analysis	Ahmad <i>et al.</i> (2023)
Structural Equation Modeling (SEM)	Statistical technique for causal relationships	Identifies ethical risks of AI in business consulting	Gînguță <i>et al.</i> (2023)
AI-driven ESG Rating & Greenwashing Detection	AI algorithms to enhance ESG ratings and detect misleading sustainability claims	Improves disclosure quality, reduces corporate greenwashing	Zhang (2024); Janice & Delina (2024)
AI Penetration Rate Analysis	Assessing the impact of AI adoption in firms	Evaluates AI's role in inhibiting greenwashing and promoting sustainability	Ren <i>et al.</i> (2025)
Text Mining & AI Disclosure Analysis	AI tools for analyzing large textual datasets	Analyzes sustainability reports to identify AI adoption trends and impact on financial performance	Balcıoğlu <i>et al.</i> (2024); Alzeghoul & Alsharari (2024)
Content Analysis & Qualitative Research	Systematic categorization of qualitative data	Identifies AI disclosure trends and its role in sustainability	Shiyyab <i>et al.</i> (2023); Sipola <i>et al.</i> (2023)
Neural Networks & Deep Learning	AI models that detect patterns in data	Predicts financial KPIs, optimizes decisions, and enhances financial forecasting	Artene <i>et al.</i> (2024); Karger & Kureljusic (2023)
Game Theory	Mathematical modeling of strategic interactions	Evaluates financial decision strategies	Artene <i>et al.</i> (2024)
Survey Analysis	Collecting and analyzing public opinions	Assesses citizens' AI regulation preferences	König <i>et al.</i> (2023)
Chatbots & AI Virtual Assistants	AI-powered virtual assistants for financial reporting and communication	Automates financial statement analysis and stakeholder interactions	Anton <i>et al.</i> (2024); Bulău <i>et al.</i> (2024)
ChatGPT-4o & AI-based Finance Tools	Large language models for financial reasoning and automation	Assists in financial analysis, but struggles with deep reasoning	Liu <i>et al.</i> (2024)

used in previous studies and how they are applied to sustainability reporting.

The table shows various AI methods used in Sustainability Reporting. AI is crucial in sustainability reporting via enhancing data analysis, improving compliance, and detecting greenwashing. Natural Language Processing (NLP) and AI-based text analytics extract information from sustainability reports to enable sentiment and greenwashing detection (Zhang & Yang, 2024; Moodaley & Telukdarie, 2023). Machine Learning (ML) and Artificial Neural Networks (ANN) enhance ESG reporting via detecting risks, projecting sustainability

performance, and decision-making assistance (Tariq & Rahim, 2024; Johri, 2025; Ozkan, 2024; Chang *et al.*, 2023). Predictive and prescriptive analytics advance corporate sustainability via ESG ratings and finance-related forecast and recommendation for best sustainability approaches (Johri, 2025; Zhang & Yang, 2024; Sariyer *et al.*, 2024; Ertz *et al.*, 2024). AI-based finance and risk analytics aid in detecting anomalies and finance distress forecasting, improving corporate governance and sustainability risk management (Oyenyi *et al.*, 2024). AI-based automation and data analytics enhance sustainability reporting efficiency via lowering

ESG data gathering with a high chance of human error (Tariq & Rahim, 2024; Riyath & Jariya, 2024; Peng *et al.*, 2023). Optimization and cluster methods identify ESG reporting trends among companies to enable effective sustainability approaches (Wang *et al.*, 2024; Burnaev *et al.*, 2023; Sariyer *et al.*, 2024). AI penetration rate analysis determines AI adoption's influence on sustainability via decreasing greenwashing (Ren *et al.*, 2025). Explainable AI (XAI) enables transparency in ESG reporting with interpretable AI models like LIME and SHAP (van der Heever *et al.*, 2024). AI-based ESG rating systems enhance disclosure quality and reduce corporate greenwashing (Zhang, 2024; Janice & Delina, 2024). Blockchain and big data technologies enhance

ESG data management further (Ahmad *et al.*, 2023). AI techniques like survey analysis and game theory aid in evaluating public opinion regarding AI regulation and finance decision-making processes (König *et al.*, 2023; Artene *et al.*, 2024). AI-based chatbots and digital assistants enable stakeholder engagement and finance reporting, and AI finance tools like ChatGPT-4o enable finance analysis (Anton *et al.*, 2024; Bulău *et al.*, 2024; Liu *et al.*, 2024). These AI tools point to increased use of AI in sustainability reporting to enhance transparency, efficiency, and conformity in corporate ESG disclosures.

Benefits of AI in Sustainability Reporting

AI greatly contributes to sustainability reporting in a

Table 4: Benefits of AI in Sustainability Reporting

Category	Benefits	Supporting Papers
Transparency & Governance	AI improves ESG data accuracy, compliance, and fraud detection	Zhang & Yang (2024); Oyeniyi <i>et al.</i> (2024); Aldemir & Uysal (2025)
Efficiency & Automation	AI automates sustainability disclosures, financial reporting, and auditing processes, saving time	Tariq & Rahim (2024); Johri (2025); Bin-Nashwan <i>et al.</i> (2024); Alzeghoul & Alsharari (2024)
Predictive Capabilities	AI enhances forecasting of ESG risks and financial sustainability	Zhang & Yang (2024); Johri (2025); Chang <i>et al.</i> (2023)
Decision-Making & Insights	AI provides real-time ESG insights and prescriptive sustainability strategies	Riyath & Jariya (2024); Oyeniyi <i>et al.</i> (2024); Ertz <i>et al.</i> (2024); Sariyer <i>et al.</i> (2024)
AI in ESG Investing	Enhances data-driven decision-making and market analysis	Khoruzhy <i>et al.</i> (2022)
Corporate Sustainability & Reporting	AI improves environmental strategies, reporting accuracy, and innovation	Burnaev <i>et al.</i> (2023); Ozkan (2024); Wang <i>et al.</i> (2024)
Greenwashing Detection	Identifies misleading sustainability claims	Moodaley & Telukdarie (2023); Janice & Delina (2024)
Financial & Operational Efficiency	Optimizes energy use, reduces waste, enhances profitability, and aligns with SDGs	Peng <i>et al.</i> (2023); Balcioglu <i>et al.</i> (2024); Artene <i>et al.</i> (2024); Sipola <i>et al.</i> (2023)
ESG Disclosure & Explainability	AI enhances structured ESG disclosures, improves transparency, and supports XAI (explainable AI)	Sætra (2021); van der Heever <i>et al.</i> (2024)
AI in Corporate Governance	Improves environmental performance and governance through enhanced ESG leadership	Ren <i>et al.</i> (2025); Sklavos <i>et al.</i> (2024)

number of ways, as illustrated in the following table and discussed in this section.

Challenges to AI in Sustainability Reporting

While AI has a number of benefits in ESG reporting, its

Table 5: Challenges of AI in Sustainability Reporting

Category	Challenges	Supporting Papers
Bias & Ethical Risks	Risk of bias in AI-generated ESG scores, discrimination concerns, and ethical dilemmas	Oyeniyi <i>et al.</i> (2024); Sariyer <i>et al.</i> (2024); Gînguță <i>et al.</i> (2023)
High Implementation Costs	AI adoption requires significant investment, expertise, and regulatory adaptation	Tariq & Rahim (2024); Bin-Nashwan <i>et al.</i> (2024); Ren <i>et al.</i> (2025)

Cybersecurity & Privacy	Data privacy concerns, cybersecurity threats, and AI model transparency issues	Zhang & Yang (2024); Johri (2025); van der Heever <i>et al.</i> (2024)
Regulatory & Adoption Barriers	Adoption challenges in developing economies, regulatory uncertainties, and compliance issues	Khoruzhy <i>et al.</i> (2022); Ren <i>et al.</i> (2025)
Explainability & Complexity	AI models can be complex, limiting accessibility and stakeholder understanding	van der Heever <i>et al.</i> (2024)
Greenwashing & Manipulation	AI can detect but also be misused for greenwashing and misinformation	Janice & Delina (2024); Moodaley & Telukdarie (2023)
Data Dependence & Integration	AI effectiveness relies on high-quality data, which may be difficult to integrate with existing frameworks	Ahmad <i>et al.</i> (2023); Shiyyab <i>et al.</i> (2023)
Energy Consumption & Sustainability	AI-driven systems require high energy usage, potentially contradicting sustainability goals	Burnaev <i>et al.</i> (2023)
Trust & Employee Acceptance	Low trust in AI among employees and stakeholders, limiting widespread adoption	Karger & Kureljusic (2023)
AI in Corporate Governance	Improves environmental performance and governance through enhanced ESG leadership	Ren <i>et al.</i> (2025); Sklavos <i>et al.</i> (2024)

use is surrounded by a number of challenges as shown in table 5 below.

CONCLUSION

This research investigated AI in sustainability reporting, with applications, challenges, benefits, and future trends. The study found that AI predictive analytics is applied in ESG risk assessment, financial sustainability forecasting, and fraud detection. Also, AI is accompanied by several benefits, including greater transparency, automation of ESG disclosure, and improved decision-making. Adoption is, however, hampered by obstacles such as ethical risks, regulative uncertainty, and privacy in data (Oyeniya *et al.*, 2024; Ren *et al.*, 2025). Some of the latest trends in AI-based sustainability reporting are increased use of XAI to improve explainability, AI-driven ESG investment research, and use of AI to improve energy efficiency in business processes (Sætra, 2021; Burnaev *et al.*, 2023). To facilitate ethical AI adoption for sustainability reporting, policymakers should create guidelines for AI-based ESG disclosures. Regulators and governments should encourage standardized ESG formats to facilitate AI adoption across sectors. AI is transforming sustainability reporting with improved predictive analytics, ESG disclosure automation, and decision-making. Although regulation barriers, ethics, and integration issues have to be addressed to maximize AI use, future research can explore AI's ability to prevent greenwashing, encourage SME adoption, and link AI-based sustainability reporting to shifting international guidelines. With AI used responsibly, business reporting can be more transparent, accountable, and sustainable.

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