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Sustainability Reporting and Artificial Intelligence: A Systematic Literature Review

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Abstract
Purpose: This study aims to evaluate the role of Artificial Intelligence (AI) in sustainability reporting. The main focus is on how AI can improve quality, efficiency, and transparency, as well as the challenges that arise in the application of AI in sustainability reporting.
Methodology/approach: The method used was a Systematic Literature Review (SLR) with three stages: planning, implementation, and reporting over the past five years (2020-2025) from 1,087 initial articles. After the PRISMA process, 30 relevant articles were selected and analyzed.
Results/Findings: The study found that the benefits of AI include improved efficiency and accuracy, management of big data, enhancement of transparency and accountability, and aiding in sustainable decision-making. The main challenges of this research are algorithm bias, personal data protection, cost and technology constraints, and the lack of global standards in AI-based reporting.
Conclusions: AI has the potential to improve quality and transparency through automation, predictive analysis, and efficient data management. However, its implementation requires regulations, guidelines, and ESG standardization.
Limitations: Most studies originate from developed countries, while developing countries contribute relatively little.
Contributions: This research highlights the importance of regulation and standardization in the implementation of AI in sustainable financial reporting. It describes the current state of affairs and provides a strong foundation for further research and policy formulation at the global level.

Keywords: *Artificial Intelligence, Deep Learning, Machine Learning, Sustainability Reporting*

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1. Introduction

Artificial Intelligence (AI) is now permeating all aspects of society. The development of digital technology has brought major changes to the business world. Innovations such as the Internet of Things (IoT), advanced robotics, 3D printing, and Artificial Intelligence (AI) have enabled automation and digital integration in work systems that were previously conventional (Oktaria et al., 2024). This includes infrastructure, law enforcement, healthcare, and the economy. As the use of AI becomes more widespread, there is increasing pressure to design and manage AI in a responsible, fair, and transparent manner (Cath, 2018). The term AI is defined as "the science of creating intelligent machines" rather than the programs themselves. AI programs are categorized into three types: Artificial Narrow Intelligence (ANI), Artificial General Intelligence (AGI), and Artificial Superintelligence (ASI).

However, the boundaries between the three are still debated, with the sole agreement being that the development and implementation of algorithms that can mimic the full range of human abilities to learn and imagine are still in their early stages (Feldman & Stein, 2022). The development of intelligent AI

is expected to have an impact on various social aspects, in line with the United Nations Sustainable Development Goals (SDGs). AI provides a great opportunity to achieve the SDGs set by the UN in its 2030 Sustainable Development Agenda, where its use provides innovation, risk assessment, business planning, and knowledge solutions (Abu-Musa & Elbastawisy, 2023).

The emergence of artificial intelligence technology is the result of future technology for traditional accounting work, with AI's analytical capabilities and long-term benefits that will create a careful shift in accounting functions through its ability to perform accurate analysis and fast computational tasks with highly efficient completion of many accounting tasks, as well as significantly contributing to facilitating, storing, retrieving, and analyzing data to overcome time and space constraints, which helps improve the quality of reports. Artificial Intelligence (AI) plays an increasingly important role in addressing the complexity of sustainability reporting and green accounting, especially in the Industry 4.0 paradigm (Tariq & Ur Rahim, 2024).

Sustainability reports cover various aspects and are an effective tool for companies to communicate with stakeholders. Companies are required to report from various perspectives. Sustainability reports are increasingly becoming a trend and a necessity for progressive companies to communicate and provide information on their economic, social, and environmental performance to all stakeholders. AI can improve sustainability reporting by making it easier for companies to collect, analyze, and communicate data. This includes integrating sustainability data from various sources, such as records, surveys, and audits, to reduce human effort and errors and potentially improve accuracy and completeness.

AI can help identify insights, patterns, trends, and anomalies in data, generate actionable reports, and assess materiality, benchmarks, and even tailor reporting to stakeholder interests and sentiments. However, the application of AI in the context of Environmental, Social, and Governance (ESG) reporting carries several risks. First, AI relies on large amounts of data to perform sustainability analysis and reporting; however, that data may not be accurate, complete, consistent, timely, or comparable (Khoruzhy et al., 2022). Second, there is no single or mandatory standard or framework for sustainability reporting, and there are many jurisdictions and stakeholders.

The development of AI worldwide has progressed at an exponential rate, with AI permeating various aspects of life. The ability of AI to learn from data has opened the door to finding more efficient solutions. Sustainability reporting has developed rapidly in line with increasing efforts and pressure from companies to convey information to various stakeholders regarding the drivers and non-financial impacts of their business performance. Thus, the process of text compilation and analysis has become an important aspect of sustainability reporting practices (de Villiers et al., 2023). However, challenges still arise related to the inconsistency of reporting guidelines, data accuracy, and the complexity of integrating sustainability information into financial reports (Achimugu et al., 2025). In an era in which awareness of sustainability issues is increasing, transparency in sustainability reports is not only a hope but also a necessity for building trust and creating long-term value.

One of the objectives of sustainability reporting is to comply with reporting regulations and standards, such as the Global Reporting Initiative (GRI). After 2015, the European Union (EU) has paid greater attention to non-financial reporting, particularly in relation to sustainability. A valid URL is required Given the increased visibility of climate change and the significant impact of the COVID-19 crisis on companies, the European Union issued new guidelines known as the Corporate Sustainability Reporting Directive (CSRD) (Mehedintu & Soava, 2023). A study by Bullock and Wilder (2016) found that GRI is not comprehensive and lacks coverage of social and economic aspects. Sustainability and digital technology have attracted research to change economic and social perspectives.

Digital sustainability is considered capable of encouraging organizations to implement sustainability that utilizes digital technology. Technology plays a crucial role in achieving sustainability goals. Artificial Intelligence (AI) and Machine Learning (ML) can be key to realizing the sustainable development goals (SDGs). The concept of sustainable AI encompasses a branch of research that is

underdeveloped, under-explored, and underfunded. AI sustainability emphasizes not only how AI can be applied to sectors such as banking, energy consumption, and sustainable health, but also how sustainability can be measured in the process of developing and using AI models. As such, little research has been conducted on AI sustainability.

This study provides a new perspective on the phenomenon of sustainability reporting in AI by providing insights into how sustainability performance uses AI to identify issues relevant to stakeholders. Specific company characteristics, such as size, profitability, and governance, have been shown to influence the level of environmental disclosure. In the context of the energy industry in Sub-Saharan Africa, Orajekwe and Ogbodo (2023) found that companies with better financial performance tend to have higher levels of ESG disclosure than smaller companies or those that are not independently audited.

Accordingly, this study conducts a Systematic Literature Review (SLR) to analyze the role of accounting in supporting the green economy, focusing on how green finance and sustainability reporting influence business decision-making. The following research questions can be posed:

RQ 1. How has research on sustainability reporting and AI developed?
RQ 2. What is the potential of AI in improving sustainability reporting?
RQ 3. What are the benefits and challenges of using AI in sustainability reporting?

2. Literature Review

2.1 Sustainability Reporting

Sustainability reporting has evolved as companies increasingly see disclosure of environmental, social, and governance information as important. With increasing pressure for disclosure from investors, regulators, and other stakeholders, companies have adopted sustainability reporting guidelines. This segment discusses how sustainability reporting guidelines have evolved, the challenges companies face, and the development of corporate disclosures. Sustainability reporting is a system of measurement, disclosure, and performance of companies to achieve sustainable development goals. The three categories of sustainability reporting are ESG information, all of which are measured based on content analysis to obtain disclosure tails and reported to external and internal stakeholders. Disclosure has evolved as companies increasingly see the disclosure of ESG information as important.

With increasing pressure for disclosure from investors, regulators, and other stakeholders, companies have adopted sustainability reporting guidelines (Achimugu et al., 2025). Some of the advantages of sustainability reporting are that it allows companies to voluntarily provide information about the ESG impacts of their activities. This advantage has a positive impact and makes it easier for investors to assess companies. In addition, sustainability reporting makes corporate sustainability activities transparent and reduces information asymmetry.

Sustainability reporting guidelines have evolved rapidly over the past decade. Initially, companies reported sustainability information voluntarily, usually in reaction to stakeholder pressure rather than regulation. However, with greater awareness of Environmental, Social, And Governance (ESG) factors, frameworks such as the Global Reporting Initiative (GRI), International Financial Reporting Standards (IFRS), and Sustainability Accounting Standards Board (SASB) have evolved to provide companies with a structured framework for disclosure. One of the first frameworks to gain international recognition was the GRI. Established in 1997, the GRI provides guidance for organizations to report ESG-related information in a consistent and comparable manner across sectors. GRI guidelines are widely applied worldwide and encourage stakeholder inclusiveness in sustainability reporting. The SASB was established in 2011 to establish industry-specific sustainability disclosure guidelines.

SASB focuses on financially material sustainability issues that influence company value and are therefore applicable to investors. While GRI has a broad stakeholder approach, SASB is designed to include financial reporting. The selection of appropriate sustainability reporting standards greatly affects the transparency and credibility of company reports, particularly in the banking sector. According to Rudiyanto and Sudrajad (2025), determining appropriate reporting standards can increase stakeholder confidence and help companies align their sustainability policies with internationally

recognized industry practices. Knowledge and compliance with sustainable accounting principles remain major challenges for the mining sector in developing countries. Nhorito (2025) asserts that low levels of sustainable accounting literacy have a direct impact on the quality and completeness of corporate environmental disclosures.

2.2 Artificial Intelligence (AI)

AI also plays an important role in sustainability studies and reporting. It can collect and analyze large amounts of data (Tariq & Ur Rahim, 2024). AI is characterized as follows: problem solving, knowledge, reasoning, machine learning, as well as communicating, understanding, and acting. The development of AI shapes a wide variety of sectors that continue to grow. AI is a branch of computer science that deals with intelligent machines that can outperform human work (Tanveer et al., 2020). AI is expected to have a significant impact on global productivity and affect various other aspects.

AI-based expert systems can be designed to interact with the environment through capabilities such as visual perception, speech recognition, and rapid response. The two main approaches in AI development that are most prominent are Machine Learning (ML) and Deep Learning (DL). ML is commonly used to describe the use of tools such as statistics, mathematics, and operational research in processing data, which is captured in a tabular form. ML techniques such as regression, clustering, and classification are used to generate insights from data. In DL, artificial neural networks are used to process data, both structured and unstructured (Nathan, 2024).

Artificial Intelligence (AI) impacts accounting by reducing errors and eliminating the use of human labor hours for mundane transaction processing tasks. AI enables Environmental, Social, And Governance (ESG) performance to be tracked in real-time so that stakeholders can be kept up to date on business sustainability programs in a timely manner. With Machine Learning (ML) algorithms, AI systems can foresee potential sustainability risks, such as environmental liabilities or governance failures, before they materialize. This feature provides companies with forward-looking strategies in sustainability management, mitigating risks, and improving long-term financial performance. AI can facilitate better decision-making by functionally linking a company's ESG strategy with investor expectations and regulatory pressures. However, there are some barriers that may hinder adoption.

3. Research Method

This study uses a Systematic Literature Review (SLR) approach to identify, evaluate, and synthesize previous research findings on the application of Artificial Intelligence (AI) in sustainability reporting. This approach was chosen because it allows researchers to obtain a comprehensive overview of trends, methodologies, and key findings in this field based on credible academic sources. The SLR was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (2020) guidelines, which emphasize transparency, replication, and objectivity in the literature review process. In general, the research process consists of three main stages: (1) review planning, (2) review implementation, and (3) reporting of results. These three stages are described systematically to ensure that the research process is structured and can be replicated by other researchers. The SLR research stages conducted in this study are described in Table 1.

Table 1. SLR process stages

Stage	Main Activities	Output
Planning	Define research questions; develop research protocols (search strategies, data sources, and analysis methods); and determine inclusion and exclusion criteria.	Systematic review protocol.
Implementation	Conducting article searches in academic databases (Scopus, Web of Science, Elsevier, Emerald, and MDPI); screening articles based on	Final dataset of relevant articles.

	criteria; evaluating the feasibility and extracting data from selected articles.	
Reporting	Presenting review results in the form of systematic descriptions, conducting thematic and bibliometric analyses, and compiling theoretical and practical implications.	Comprehensive and transparent SLR result report.

The inclusion and exclusion criteria were used to determine which studies were relevant and eligible for inclusion in the review. The details of the criteria are presented in Table 2.

Table 2. Inclusion and exclusion criteria

Aspect	Inclusion Criteria	Eclusion Criteria
Year of Publication	Scientific articles published between 2020 and 2025.	Articles published before 2020 years
Language	Articles in English or Indonesian	Articles in Other Languages.
Document Type	Indexed journal articles (Scopus, WoS, Elsevier, Emerald, and MDPI).	Non-academic sources (ResearchGate, PaperASIA, unindexed proceedings)
Research Focus	Studies discussing the application of AI in sustainability reporting or relevant topics (AI for sustainability disclosure/reporting).	AI studies are unrelated to sustainability reporting or topics outside the ESG context.
Research Design	Empirical, qualitative, quantitative, mixed, or systematic literature review articles	Opinion pieces, editorials, or articles without explicit methodology.

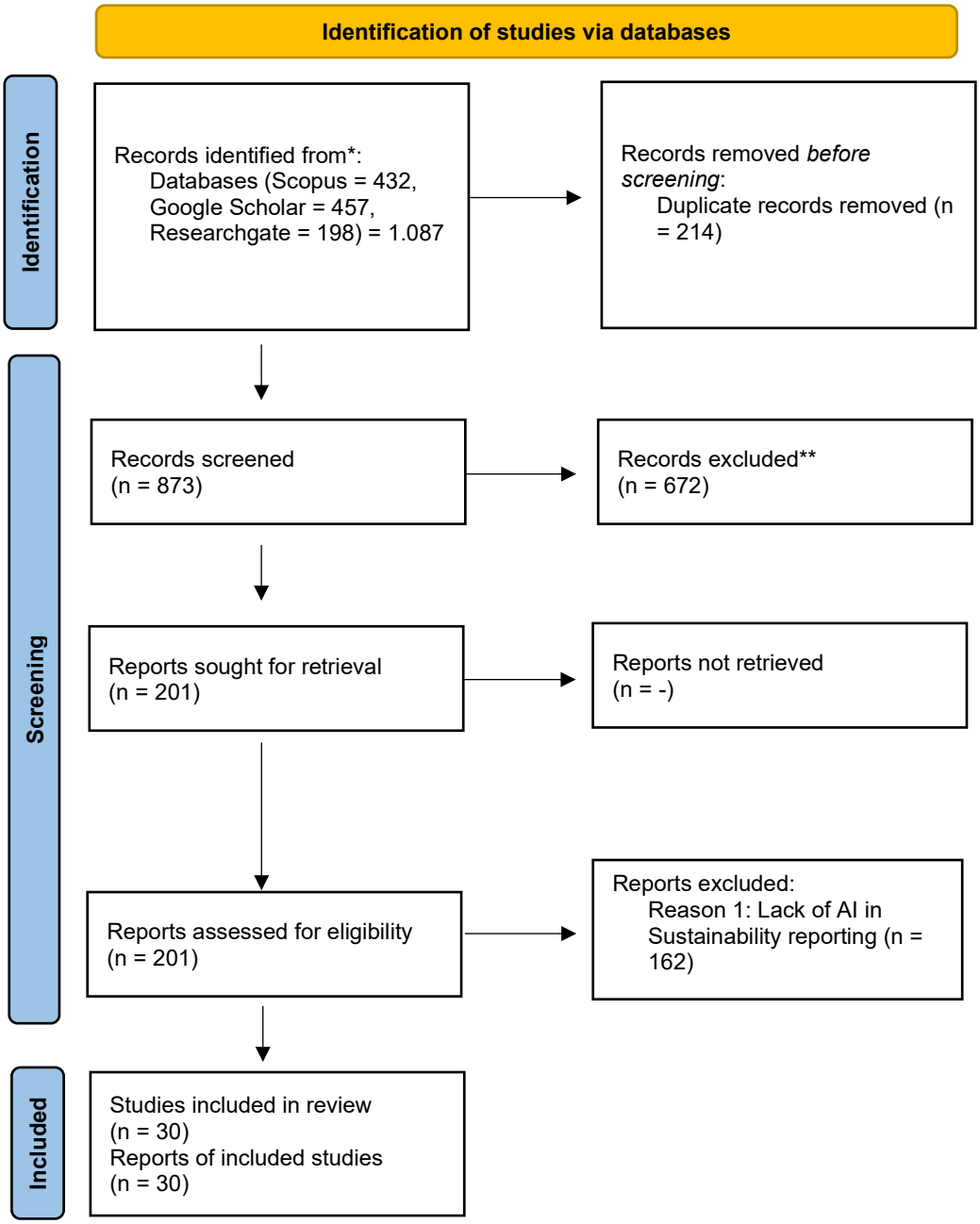

Figure 1: PRISMA flow chart

A literature search was conducted on five reputable academic databases, namely Scopus, Web of Science, Elsevier, Emerald Insight, and MDPI, using a combination of keywords such as "artificial intelligence," "AI," "sustainability reporting," and "ESG disclosure." The search was conducted using the Publish or Perish (PoP) tool to integrate the results from various sources. The initial search yielded 1,087 articles. After removing duplicates and conducting an initial screening based on titles and abstracts, the number of articles was reduced to 201 that met the initial criteria. These articles were then selected through four stages in accordance with the PRISMA guidelines, namely identification, screening, eligibility, and inclusion. Ultimately, 30 articles met all the criteria for further analysis.
The main reasons for excluding articles at the eligibility stage were as follows:

a. Focusing on the application of AI in the context of sustainability reporting (58 articles).
b. Lack of adequate methodology or clear description of analysis (71 articles)
c. Failure to meet the academic publication quality standards (33 articles).
d. Incomplete or irrelevant data to the research question (nine articles).

Table 3. Article publication index

No	Index	Number of Articles
1	Q1	13
2	Q2	6
3	Q4	11

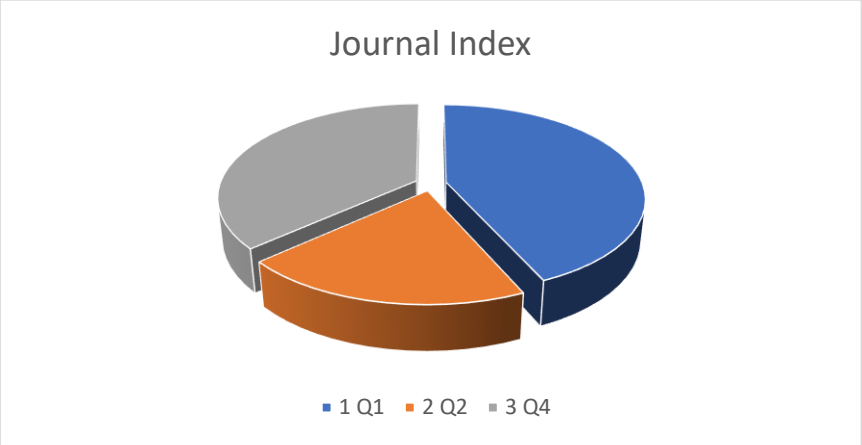

Figure 2. Journal index

Table 3 shows that from the 30 articles that passed the inclusion stage, a systematic data extraction process was conducted to obtain key information using two approaches:

1. The present study applies a thematic analysis to identify conceptual patterns, dominant themes, and research directions in the field of AI and sustainability reporting.
2. Bibliometric analysis to map keyword networks, publication trends, and relationships between research variables

Two software programs supported this analysis:

1. VOSviewer is used for visual bibliometric mapping (co-occurrence and network analysis).
2. NVivo 12 was used for coding and qualitative thematic analysis.

The distribution of articles shows that the majority of publications come from Q1 journals, indicating high academic quality and a strong level of relevance to the field of research. No articles from Q3 journals were found because the search results did not show any relevant publications in that category during the 2020–2025 period. In addition, the reviewed articles covered various methodological approaches, such as quantitative, qualitative, mixed methods, and SLR, demonstrating the diversity of perspectives and scientific contributions in examining the integration of AI technology with sustainability reporting practices.

This study has several limitations that need to be considered. First, the analysis time frame is limited to the period 2020–2025; therefore, the review results do not include research prior to that period. Second, the databases used are limited to Scopus, WoS, Elsevier, Emerald, and MDPI; thus, there is a possibility that some relevant articles from other sources are not accessible. Third, the article screening and eligibility assessment process has the potential to cause selection bias because it involves the subjective interpretation of researchers in determining the relevance and quality of the studies. However, mitigation measures were taken by applying clear and consistent criteria to maintain the objectivity of the results.

4. Results and Discussion

4.1 Research Results

4.1.1 RQ1 Distribution of Research Countries

Research related to AI and sustainability reporting has covered several countries, both developed and developing. This discussion answers RQ1, which found that many developed countries have adopted

research on AI and sustainability reporting. However, developing countries, such as Indonesia, India, and Malaysia, have also contributed to this research. This distribution shows that the development of AI and sustainability reporting research is still widely researched and in demand in developed and developing countries.

Table 4. Countries of Study

No	Country	Number of Articles
1	Amerika	5
2	Africa	4
3	Rusia	1
4	China	2
5	Eropa	2
6	India	4
7	Indonesia	1
8	Inggris	1
9	Italia	1
10	Jerman	1
11	Malaysia	2
12	Mesir	1
13	Yordania	1
14	Uzbekistan	1
15	Denmark	1
16	Serbia	1
17	Romania	1
Total		30

Table 4 shows the contribution of countries to relevant research. Of the total 30 studies, most came from the United States (5 articles), indicating that most research topics were conducted in the United States. This was followed by Africa, including South Africa and India (each with 4 articles), Europe (3 articles), Malaysia and China (each with 2 articles), and several other countries (1 article each) that participated in the topics discussed in this study. The United States is the most researched country in this SLR. Research by Achimugu et al. (2025) states that the use of blockchain supports data security and reporting efficiency.

This study also supports AI in strengthening sustainability reporting. Morio et al. (2024) also supports the rapid development of AI because this study uses the Reportparse system, which provides automated and structured tools from documents that are usually in non-standard formats. In addition, this research supports the development of AI application policies to significantly improve the efficiency, accuracy, and scalability of analysis. According to de Villiers et al. (2023), in developed countries, the development of AI in sustainability reporting has great potential in the accessibility of non-financial information reports.

One perspective on AI development from a developing country is China, for example, the research of Wang et al. (2025), which describes how NLP technology can improve the data analysis process and has the potential to reduce the uniqueness of reports with uniform standards. Nathan (2024) in Nigeria, Africa, states that statistical test results show that more than 50% of respondents consider AI to be an effective tool in improving sustainable accounting practices in Nigeria. However, this study has geographical limitations, and further research is needed to adopt AI in the current era of sustainability.

4.1.2 Analysis of Research Sectors

The industrial sector is dominant, accounting for eight articles, followed by corporations (seven articles), technology (four articles), and two articles each in the education, manufacturing, and general studies sectors.

Tabel 5. Research sectors

Sector	Author	Article
Company	(Abu-Musa & Elbastawisy, 2023; Kalbouneh et al., 2023; Mehedintu & Soava, 2023; de Villiers et al., 2024; Achimugu, Ukatu, & Anaege, 2025; Kakhorov et., 2024; Wang et al., 2025)	7
Education	(Tanveer et al., 2020)	2
Industry	(Tariq & Ur Rahim, 2024; Bakri et al., 2024; Wilhelmi et al., 2024; Menichini & Maria Strollo, 2024; Morio et al., 2024; Moodaley & Telukdarie, 2023; Petcu et al., 2024; Tiwari & Khan, 2020)	8
Manufacturing	(Onyeka, 2024; Nathan, 2024)	2
Technology/Digital	(Katsamakas, 2024; Karbekova et al., 2023; Hillebrand et al., 2023; Iriant et al., 2025)	4
Not Spesific	(van Wynsberghe, 2021; Sætra, 2021)	2

Based on Table 5, it is evident that most relevant research focuses on the industrial sector (8 articles) and the corporate sector (7 articles) concerning AI and sustainability reporting. This indicates that the corporate and industrial sectors are the most researched subjects, reflecting a high level of attention to the dynamics and challenges faced in the context of the topics studied. In the education sector, although it is less dominant, there is still interest in the role of educational institutions or the educational aspects of the topic. The industrial sector discusses more specific aspects, such as management and operations, indicating ongoing research on sustainability in this sector. The manufacturing sector contributed two articles that explicitly focused on manufacturing, demonstrating production efficiency and compliance with sustainability.

The technology sector explored the role of digital technology in addressing global trends in technology adoption as a modern solution. Finally, two studies did not focus on a specific sector but discussed the topic from a general or theoretical perspective. The corporate sector has conducted the most research on Artificial Intelligence (AI) and sustainability reporting. For instance, Abu-Musa and Elbastawisy (2023) predict the future development of AI because of its ability to process large amounts of data efficiently and accurately, resulting in more transparent and reliable reports. In the education sector, Tanveer et al. (2020) state that the education industry and AI have driven innovation, thereby increasing jurisdictional benefits and sustainability reporting. In the industrial sector, Tariq and Ur Rahim (2024) note that the application of AI for sustainable environmental monitoring makes it easier for corporate governance teams to review corporate sustainability reporting.

The manufacturing sector has also contributed to this research. Nathan (2024) shows that most of the workload used by Nigerian and African entities in using AI to perform analytical procedures on manual accounting systems. This shows that the development of AI use has a positive impact on the sector. Finally, van Wynsberghe (2021) proposes that sustainable AI should not only focus on AI applications but also on sociotechnical AI systems as a whole, suggesting that sustainable AI is not only about how to maintain AI development but also about how to develop AI that is compatible with sustainable environmental resources for current and future generations.

4.1.3 RQ2 AI Techniques Used in Sustainability Reporting

In response to RQ2, Table 6 presents the AI techniques used in previous studies and their applications in sustainability reporting. AI is crucial in sustainability reporting because it improves data analysis and increases compliance. This table shows the techniques used in previous studies and explains the potential of AI techniques to perform their tasks to assist sustainability reporting, thereby improving the accuracy and efficiency of decision-making. Table 6 presents the AI technology tools in sustainability reporting.

Table 6. AI technology tools in sustainability reporting

AI Techniques	Definition	Supporting Articles
Natural Language Processing (NLP) & Machine Learning (ML)	AI-based text analysis for extracting the language of insights from sustainability reports	(Tariq & Ur Rahim, 2024; de Villiers et al., 2024; Achimugu et al., 2025; Morio et al., 2024; Nathan, 2024; Wang et al., 2025)
Machine Learning (ML), Deep Learning (DL)	Using historical data to forecasting and providing recommendations	(Abu-Musa & Elbastawisy, 2023; Sætra, 2021; Tanveer et al., 2020; Onyeka, 2024)
Bibliometric	AI-based tools for financial and ESG data processing	(Kalbouneh et al., 2023; Bakri et al., 2024; Moodaley & Telukdarie, 2023)
Deep Learning (DL) & Natural Language Processing (NLP)	AI techniques for data clustering and efficient resource allocation	(van Wynsberghe, 2021; Achimugu, Ukatu, & Anaege, 2025; Kakhorov, Yodgorova, & Khayrullayev, 2024)
Artificial Neural Networks (ANN), SEM Support Vector Machines (SVM)	AI algorithms that learn patterns from data to improve predictions	(Mehedintu & Soava, 2023; Wilhelmi et al., 2024)
ChatGPT, Chatbot	AI that supports financial reporting and communication	(Bakri et al., 2024; Karbekova et al., 2023; Petcu et al., 2024)

Table 6 lists several AI techniques used in various sectors and applications. Hillebrand et al. (2023) used an SVM and demonstrated that the use of this method varies significantly depending on the purpose of the analysis, target audience, and area of focus on sustainability. NLP is also used to analyze text content in sustainability reports, such as detecting ESG terms, classifying sustainability issues, and evaluating companies' non-financial narratives. Tariq and Ur Rahim (2024) replicated human intelligence in machines, specifically ML computer systems, to perform cognitive functions such as learning, reasoning, problem solving, and decision making. Although similar, Mehedintu and Soava (2023) used ANN and SEM modeling techniques to assess the impact of indicators that have the potential to provide a new paradigm.

Meanwhile, research using deep learning and machine learning techniques analyzes data and deep learning models to predict future climate change scenarios. Abu-Musa and Elbastawisy (2023) promote sustainability and address environmental, social, and governance issues by using machine learning algorithms and Internet of Things sensors that can optimize the use of resources, such as water, electricity, and food, and analyze data to reduce energy consumption, predict weather patterns, and improve supply distribution networks to reduce waste. Kalbouneh et al. (2023) highlight important breakthroughs in sustainability accounting research by linking innovation to existing problems related to the application of sustainability accounting using bibliometric analysis to evaluate performance in specific areas in the literature. Bibliometric analysis and the ChatGPT application. Bibliometric analysis is used to answer research questions regarding the evolution and trends in research on sustainability reporting. ChatGPT is used to answer questions about the most influential authors and collaborations between authors in sustainability reporting studies.

4.1.4 RQ3 Benefits and Challenges of Using AI in Sustainability Reports

The use of AI in sustainability reporting is increasing in line with growing ESG transparency requirements. One of the main advantages of AI is its ability to automate data collection and analysis processes. However, the use of AI in sustainability reporting also faces several challenges that cannot be ignored. Table 5 presents the results of disclosure of benefits and challenges described in previous studies, which will help answer RQ3.

Table 7. Benefits of using AI in sustainability reporting

No	Benefits of AI	Reference
1	Efficiency and accuracy	(Abu-Musa & Elbastawisy, 2023; Wilhelmi et al., 2024; Hillebrand et al., 2023; Kakhorov et al., 2024; Karbekova et al., 2023; Petcu et al., 2024; Tanveer et al., 2020; Irianto et al., 2025; Nathan, 2024; Onyeka, 2024)
2	Can manage big data and be analytically minded	(Kalbouneh et al., 2023; Wang et al., 2025; Bakri et al., 2024; Tiwari & Khan, 2020; Kulkarni et al., 2024; Nyantakyi et al., 2023)
3	Transparency and accountability	(Sætra, 2021; Tariq & Ur Rahim, 2024; Achimugu et al., 2025; Menichini et al. 2024; Moodaley & Telukdarie, 2023; Vărzaru, 2022)
4	Communication trends and patterns of strategic tools	(de Villiers et al., 2024; Morio et al., 2024; Saxena et al., 2023; Jankovic & Curovic, 2023)
5	Contribute in the aspect of environment (carbon emissions)	(Mehedintu & Soava, 2023; van Wynsberghe, 2021)
6	Provide transformation progression digital	(Katsamakas, 2024; Phuong et al., 2024)

In recent years, the use of Artificial Intelligence (AI) in sustainability reporting has gained increasing attention from academics and practitioners. Several studies have shown that AI has great potential to improve the quality, efficiency, and transparency of sustainability reporting. However, technical, ethical, and operational challenges have also been identified. In general, AI provides significant benefits in terms of reporting efficiency and accuracy. For example, Abu-Musa and Elbastawisy (2023) proved that AI can improve the efficiency and accuracy of sustainability reporting, especially in the context of the GRI-G4 standard. Similarly, Wilhelmi et al. (2024) and Hillebrand et al. (2023) showed that AI improves data efficiency and accuracy through algorithm-based analysis systems.

AI also plays an important role in big data processing and analytical insights, as described in the studies by Kalbouneh et al. (2023) and Wang et al. (2025), which mention that AI helps filter relevant information and improve the understanding of reporting content. The benefits of AI also include increased transparency and accountability. Sætra (2021) and Tariq and Ur Rahim (2024) emphasized that AI helps create more transparent and accountable reporting. Furthermore, AI's ability to facilitate the understanding of non-financial information de Villiers et al. (2023) and detect trends and patterns in sustainability communication Morio et al. (2024) makes it a strategic tool for strengthening ESG communication. AI also contributes to environmental aspects; for example, Mehedintu and Soava (2023) showed that this technology can help control carbon emissions. Katsamakas (2024) stated that AI-based digital transformation supports better decision-making in the context of sustainability.

Table 8. Challenges of Using AI in sustainability reporting

No	Challenges AI	Reference
1	Causes risk of algorithm bias	(de Villiers et al., 2024; Sætra, 2021; Katsamakas, 2024; Morio et al., 2024; Tanveer et al., 2020; Moodaley & Telukdarie, 2023; Kulkarni et al., 2024; Saxena et al., 2023; Jankovic & Curovic, 2023)
2	Personal data protection in implementation	(van Wynsberghe, 2021; Moodaley & Telukdarie, 2023; Petcu et al., 2024; Tariq & Ur Rahim, 2024; Phuong et al., 2024)

3	Cultural challenges in language translation	(Kakhorov et al., 2024; Hillebrand et al., 2023; Wang et al., 2025)
4	Resources	(Mehedintu & Soava, 2023; Nathan, 2024; Menichini & Maria Strollo, 2024; Onyeka, 2024; Tiwari & Khan, 2020)
5	Implementation cost constraints and technology dependency	(Karbekova et al., 2023; Irianto at el., 2025; Abu-Musa & Elbastawisy, 2023; Bakri et al., 2024; Wilhelmi et al., 2024; Nyantakyi et al., 2023; Vărzaru, 2022)
6	Regulation and institutional unpreparedness	(Achimugu et al., 2025; Menichini & Maria Strollo, 2024)

However, these benefits come with significant challenges. One of the most common challenges is the risk of algorithmic bias and data quality, as mentioned by de Villiers et al. (2023), Katsamakas (2024), and Sætra (2021). AI's dependence on high-quality input data makes the reporting process vulnerable to bias and manipulation if the data used are inadequate. Other issues that have been mentioned include ethics, security, and data privacy. Research by van Wynsberghe (2021), Moodaley & Telukdarie (2023), and Petcu et al. (2024) emphasizes the importance of regulation and personal data protection in the implementation of AI for sustainability reporting. Kakhorov et al., (2024) also highlights that linguistic and cultural challenges in translating sustainability reporting can hinder the global use of AI. Challenges related to human resources and technical capacity are a particular concern, as highlighted by Mehedintu and Soava (2023) and Nathan (2024).

They reveal that the lack of skilled human resources and technological readiness in companies, especially in developing countries, is a major obstacle. Onyeka (2024) also adds that geographical and infrastructure factors influence the optimal implementation of AI. In addition, there are challenges related to implementation costs and dependence on technological infrastructure, as described by Karbekova et al. (2023) and Irianto et al. (2025). High initial investments and the need for reliable systems make AI adoption an additional burden for some organizations, especially in the MSME sector. Finally, regulatory challenges and institutional unpreparedness are another obstacle, as noted in the studies by Achimugu et al. (2025) and Menichini & Maria Strollo (2024). The absence of standards or guidelines for the use of AI in sustainability reporting leads to variations in practices and potential misunderstandings in data interpretation.

5. Conclusions

5.1 Conclusion

This study examines the use of AI in sustainability reporting, focusing on its application across different countries, sectors, techniques, and its benefits and challenges. The findings reveal that AI-based predictive analytics are being used in various areas, such as ESG risk assessment, financial sustainability performance forecasting, fraud detection, and data privacy protection. AI offers several advantages, including enhanced transparency, automation of reporting processes, and improved decision-making. However, challenges such as data bias, regulatory uncertainty, and privacy concerns remain obstacles to its widespread adoption. To ensure the ethical application of AI in sustainability reporting, the establishment of clear guidelines for AI-based ESG disclosure is essential. Additionally, support from regulators and governments in developing standardized ESG reporting formats is crucial for cross-sector AI adoption. The responsible use of AI is expected to make corporate reporting more transparent, accountable, and focused on long-term sustainability.

5.2 Research Limitations

This study is limited by the scope of data sources and publication periods considered, as the field of AI in sustainability reporting is rapidly evolving. The analysis was confined to the information available at the time of research, which may not fully capture the most current technological advancements or regulatory changes. Additionally, the research primarily focuses on AI applications within specific sectors, which may not provide a comprehensive global view of AI's potential in sustainability reporting

across all industries. Future studies can address these limitations by incorporating a wider range of sources and a longer publication period to capture the latest developments.

5.3 Suggestions and Directions for Future Research

Future research should broaden the scope of data sources and publication periods to capture ongoing advancements in AI technology, especially in the field of sustainability reporting. Using a more extensive international database and covering a longer timeframe would allow for a more detailed and comprehensive analysis of AI's impact on sustainability reporting. Furthermore, future studies could explore the development of standardized frameworks for AI-based ESG disclosures, the role of policy and regulation, and the ethical considerations surrounding AI applications in corporate reporting. Expanding research into cross-sector collaborations and best practices could also enhance the effectiveness and adoption of AI in sustainability reporting.

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Author Contributions

MP contributed to the conceptualization, study design, data collection, analysis, and manuscript drafting and revision. IM assisted with the study design, data collection, and analysis. SFK contributed to the manuscript drafting, revision, and supervision. All authors participated in the final approval of the manuscript.

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