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Ai-Driven Esg Disclosures: A New Frontier For Greenwashing Risk And Regulation

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Abstract: The introduction of Artificial Intelligence (AI) is having a big impact on Environmental, Social, and Governance (ESG) disclosures in sustainability reporting. AI increases the ability of companies to gather a lot of data, notice ESG trends, analyse any risks, and publish more accurate details about their impact. This allows those involved in managing the financial sector to use more open, reliable, and easy-to-use ESG information. Therefore, making decisions is easier, following progress gets clearer, and dedication to sustainability increases. Even so, using AI in ESG reporting leads to some important matters to consider. Greenwashing is one of the main challenges because companies might misrepresent their positive actions in the name of sustainability thanks to tools powered by AI. In many cases, ESG disclosures that are not truthful, which are commonly related to a desire for a good reputation or more money, may lead stakeholders to doubt the truthfulness of the company's environmental, social, and governance activities and bring disrepute to the company. Unregulated use of AI can make the ESG data less reliable and more open to being used incorrectly. Currently, it is still difficult for companies to use GRI, SASB, and TCFD frameworks to handle AI matters in their ESG reports. There is also a gap in how the current laws and regulations deal with the special issues of AI in sustainability reporting. It looks into the threats that might stem from AI ESG reporting, mainly related to AI washing and greenwashing. It underlines that effective rules are needed and asks government and businesses to use AI in ESG reporting in a clean, honest, and responsible way.

Index Terms - Artificial Intelligence, ESG Disclosures, Greenwashing, AI Washing, Regulation, Sustainability Reporting.

I. INTRODUCTION

At first, it was optional, but now it is vital in the areas of corporate governance and decision-making about investments. These days, companies must focus on making profits along with being responsible, ethical, and truthful. Since ESG ratings matter to investors and establish a company's image, ESG reporting has to be done properly and dependably. More and more, companies are adopting AI such as machine learning (ML), natural language processing (NLP), and large language models (LLMs) to assist with sustainability reporting. AI

allows for processing a lot of data on emissions, labour practices, board differences, and climate issues, and it generates reports based on frameworks like GRI, SASB, and TCFD. By achieving higher accuracy, the process also gets quicker so that both investors and regulators benefit. Even so, a number of issues remain. With the help of AI, companies can deceive people by selectively showing results that make their practices look better or hid things that might seem suspicious using complex algorithms. Checks made by human auditors cannot keep the same speed as AI reports. It also happens that companies deceptively claim to apply AI to impress consumers and seem more responsible or eco-friendly, for instance by making it sound like AI is in charge of more than it really is in those areas.

Laws are not able to keep pace with the growth of new technologies. Although various climate and environmental disclosure laws are in place in the EU and U.S., they tend to ignore the risks that AI may carry. Since there are no uniform standards, it is hard to compare and find misinformation. Such a gap in NFT regulation causes people to worry about accountability, the safety of consumers, preventing fraud, and how data is managed. If this issue is not handled, it can harm people's faith in the system and also set back progress in forming agreements such as the Paris Agreement and SDGs. Recent trends are examined in this paper to bring out areas that need improvement. Some suggestions are increasing AI transparency, requiring external audits, creating clearer rules, and setting rules for each industry. Overall, encouraging ethics in AI and good digital management will support solid ESG reports, secure investors, and help the economy grow in the future.

II. Literature Review

I. AI Integration in ESG Disclosures

Moodaley and Telukdarie (2023)[1], studied in depth the topics of sustainability reporting, greenwashing, and how AI—mainly ML—is being used in corporations. Being concerned with misinformation contained in disclosures and the capabilities of AI to reduce it, the authors searched and extracted data from the Scopus database for scholarly articles and books. The research focuses on the role of AI and ML methods in spotting or dealing with greenwashing as it appears in the sustainability reports of companies.

The researchers saw that a lot is written on sustainability reporting and AI/ML, but the field where AI/ML is related to greenwashing has little literature available. Although AI is commonly used for reviewing sustainability disclosures, most of its use in detecting greenwashing is still theory rather than a practical application. More people are interested in these topics today after the 2015 Paris Agreement drew attention to sustainability and inaccurate news. Only a few studies look at all three topics at once, which shows how unique and meaningful this research is. Most research has identified greenwashing or sustainability reporting with AI/ML, but has ignored looking at them all together. While some uses of AI in fighting greenwashing are becoming clear, there are not many sets of ideas explaining how AI can tackle the problem. Most publications are specialized and fail to use ideas from business, technology, environment, and communication together. Also, since the review depends on academic research, it doesn't consider actual technologies currently being used in the business world. In all, the study helps provide a good base for ongoing work that combines

[1] Wayne Moodaley & Arnesh Telukdarie, *Greenwashing, Sustainability Reporting, and Artificial Intelligence: A Systematic Literature Review*, 15 SUSTAINABILITY 1481 (2023).

technology and questions of sustainability ethics. It supports the idea that different specialists should join forces and put more emphasis on AI and ML to improve how transparent sustainability reports are.

Perera et al. (2024)[2] suggest using Environmental, Social, and Governance (ESG) principles throughout the whole process, beginning with the design and development, followed by deployment and continuous monitoring. Since they thought AI systems should be secure, impartial, and ethical, the authors formed their framework after engaging with key players in the industry. Its main values are fairness, transparency, being held accountable, caring about human rights, caring for nature, and making a positive influence on the community. It tries to show businesses how to use AI ethically to benefit public citizens and comply with necessary regulations. It underlines that AI ethics is tied to ESG, but this subject receives little attention and few steps to put it into practice.

Even though the framework covers a lot, it still has limitations. There is not much data to prove that digital transformation works or can be adapted, and only a few examples are found in fields such as healthcare, finance, or the government. It responds to debates instead of acting as a proven answer. There are still concerns about how machine learning can be beneficial for places with limited resources, places governed by several different laws, or organizations that do not use AI fully. It is assumed that all organizations commit as much to ESG principles as each other, which might not always happen. It is very important to check whether the strategy keeps up with new ESG and AI standards worldwide and can deal with issues in various industries. If the framework is tried out, compared with similar ones, and the practical advice is documented, it will become more valuable for businesses.

Zhang (2024)[3] look into the impact of AI on ESG in Chinese enterprises using polling of various firms across 2014-2021. The research, presented in Science of the Total Environment, demonstrates that using AI together with ESG information brings positive changes in greenhouse gas and emissions reporting. The authors suggest that AI technology, especially for handling data, constant monitoring and reporting, allows firms to offer credible and confirmable sustainability details, thus earning the confidence and trust of people they deal with. As a result, AI can play a role in helping companies comply with corporate sustainability standards within the business world.

Even so, the study does not address all issues and still has some weaknesses. There is a big limitation in this study because it only looks at firms in China which has its own distinct rules and political climate. In this situation, strict control from the state, ongoing ESG law development and governing all data from a central place do not represent all countries. As a result, it is hard to say whether the findings can be applied to other nations with distinct regulations, levels of AI use or ESG reporting rules. To gain more insights, researchers should analyze data from multiple countries to see if AI impacts ESG transparency similarly all over the world. Looking into the AI strengths and practices within different sectors or businesses may reveal more sophisticated reasons behind AI's impact on ESG.

[2] Harsha Perera et al., Achieving Responsible AI through ESG: Insights and Recommendations from Industry Engagement (Aug. 30, 2024), http://arxiv.org/abs/2409.10520.

[3] Dongyang Zhang, *The Pathway to Curb Greenwashing in Sustainable Growth: The Role of Artificial Intelligence*, 133 ENERGY ECONOMICS 107562 (2024).

Birti, Osborne and Maurino (2025)[4] examine LLMs' skills to recognize ESG activities in financial text which is becoming more important since companies are now paying more attention to ESG in their activities and statements. The work proposes a new database called ESG-Activities that was built to aid supervised learning for the purpose of identifying ESG content in financial reports, investor meetings and regulatory documents. Clarifying the details on this carefully built dataset, the authors have proven that their models can better pick out and sort activities linked to ESG, mainly those involved in environmental practices. It has a big impact, since it gives researchers and practitioners a new methodology and a valuable tool to monitor companies' sustainability using AI.

Still, the study's results should be viewed with some limitations in mind. Most of the dataset and model evaluations are about environmental-related ESG aspects, while social and governance topics are not mentioned as much. Because of this issue, the model might be less helpful where matters of social justice, work conditions, ethical behavior or board diversity are main concerns. As a result, the approach helps with environmental monitoring, but it is not yet fully equipped to support ESG analysis all-around. Moreover, it does not consider how the special meaning and phrasing of social and governance indicators could play a role in the traceability of models. It is important for future study to broaden and enrich the ESG-Activities dataset to match the richness of ESG reporting, so newer models can understand its complexity and help in understanding all three ESG pillars worldwide

II. Detection and Analysis of Greenwashing

In the Journal of Sustainable Finance, Yu et al. (2025)[5] looked into how Generative AI is gaining relevance in reviewing and shaping ESG efforts of companies. It also mentions that Generative AI plays both a positive and a negative role in the field of ESG reporting. By using AI, ESG assessment could be improved through evaluating complex (unstructured) information, discovering insights from reports and highlighting possible gaps in reporting. At the same time, the authors recommend that businesses motivated by greenwashing might take advantage of Generative AI to write big statements about their sustainability, yet they might not be honest about their environmental policies. Because it is not always clear what to do, it is important to establish strong rules and watchdogs for AI in ESG communication.

Though the concept about AI's effects on ESG disclosure is convincing, the study does not have many practical examples or research. There are mainly theoretical concerns about possible misuse of Generative AI and these sensitivities would be enhanced by seeing real cases or data showing how such misuse might occur. The paper also fails to discuss the current regulations or technology that could minimize or address the problem of AI-enabled greenwashing. Researchers should explore Generative AI's actual impact on good ESG disclosure, work on ways to distinguish AI-generated false statements and assess how the governance system can respond to new challenges brought by AI.

[4] Mattia Birti, Francesco Osborne & Andrea Maurino, Optimizing Large Language Models for ESG Activity Detection in Financial Texts (Feb. 28, 2025), http://arxiv.org/abs/2502.21112.

[5] Georgios Pavlidis, Empowering Sustainable Finance with Artificial Intelligence: A Framework for Responsible Implementation23 (2025), http://arxiv.org/abs/2505.12012.

Vinella et al. (2023)[6] study, built a new way to catch greenwashing by using innovative language models. They used ClimateBERT, designed for climate, to spot any suspicious environmental statements. They have found that through NLP, it becomes easier to track and understand what companies do to protect the environment. On the other hand, the review points out a few restrictions. The labels for the model were mostly created by computers rather than by people. Depending too much on a specific type of data can cause biases and lower the value of the model in several contexts. It is hard for the model to understand the special meanings of greenwashing language without help from experts. It is advised that future studies concentrate on increasing the size and expertise of the training datasets to enhance how reliable and easy to understand the model becomes. In addition, analyzing the model in different industries, languages, and regulatory settings would show whether it can be used around the world.

According to **Gorovaia (2023)**[7]**,** NLP can be used to detect greenwashing in CSR reports, noting that the increasing use of AI systems might make it easier to fulfill corporate transparency standards. Published in European Financial Management, this study reveals the method AI can use to check environmental statements and spot misleading claims by studying the language, attitudes and differences found in corporate social responsibility statements. This way, regulators, investors and other interested parties can follow corporate ESG communications in a standard and reliable way. Because of AI-NLP, Gorovaia's study helps push forward progress in a crucial field that joins machine learning, environmental finance and governance.

The study provides a lot of useful information, but it does not take into account the rising number of non-textual greenwashing strategies such as misleading images, videos or different types of digital media seen in sustainability communications. While organizations use rich videos, graphics and other media, the risk of using visuals or sound to commit greenwashing is still not considered in this research area. As a result, it is evident that while NLP helps with written disclosures, actual prevention of greenwashing needs to use AI systems that handle multiple data types. Moving forward, efforts should be made to involve image recognition, video review and more AI tools to contribute to a better analysis of corporate ESG messages.

III. Regulatory Frameworks

As of 2024, the **Green Claims Directive**[8] As of 2024, will make sure businesses provide correct and audited proof for their "green" claims to prevent greenwashing. The law is designed to shield consumers, help them make good decisions, and make sure EU businesses stick to the same environmental regulations. Common rules will encourage people to trust green products and services. Even so, this directive does not mention the growth of AI in ESG reporting. Even though AI is increasingly involved in sustainability reporting, the directive does not outline how to handle its disadvantages and advantages. It does not manage problems with algorithms or unreliable data that could influence ESG assessments of companies. Since this is the case, ESG report improvement and overseeing risks with AI-powered tools are not fully supported. For AI to be successfully used in sustainability governance, policymakers ought to lay out well-defined rules or guidance

[6] Avalon Vinella et al., Leveraging Language Models to Detect Greenwashing (Nov. 24, 2024), http://arxiv.org/abs/2311.01469.
[7] Nina Gorovaia & Michalis Makrominas, Identifying Greenwashing in Corporate-Social Responsibility Reports Using Natural-Language Processing, 31 EUROPEAN FINANCIAL MANAGEMENT 427 (2025).
[8] Green Claims - European Commission, (Jun. 5, 2025), https://environment.ec.europa.eu/topics/circular-economy/green-claims_en.

about it. For the directive to remain successful in the long run and guarantee honest, clear AI-led ESG reporting, it is important to address this issue.

The CSRD[9],increases the EU's sustainability reporting standards and makes them apply to listed SMEs and large private companies, with the changes being put in place starting in 2024. As a result, businesses are needed to apply the European Sustainability Reporting Standards (ESRS) to ensure their ESG disclosures are on par, satisfying the demands of everyone involved for a more sustainable economy. But the CSRD does not offer much advice on revealing AI-related details, even though large companies depend on AI to collect data, automate their reporting, look at climate matters, and write ESG narratives. Without guidance on using AI, it may not be clear, reliable, or transparent, which may result in more bias, less supervision, and less truthful headlines. The updates to CSRD and ESRS in the future should clearly outline how AI governance will be managed, for example, by setting data transparency standards and giving a joint duty of care. As a result, AI can work with the directive instead of going against its main aims.

The **FCA[10]** created the Anti-Greenwashing Rule to make sure sustainability and finance were honest and transparent. Firms are asked to support their green or sustainable actions with solid proof and precise information in advertisements, reports, and investments. The goal of doing this is to decrease false environmental messages and help make sustainability-related actions trustworthy, which goes hand in hand with worldwide efforts to protect people in the growing green finance sector.

Still, the rule does not explain how AI-generated disclosures are handled. As more sustainability information is spread by AI, some are worried because the rules for verifying it remain unclear. The fact that AI is difficult to understand allows for more greenwashing, and the present approach is not enough to address it. Laws for the future should clearly explain how AI should be used for disclosures about sustainability to maintain their accuracy in an ever-changing online environment.

The UK Government's **Green Claims Code[11]** teaches companies how to tell consumers about their environmental practices truthfully and with proof. It highlights six methods to avoid greenwashing and shield customers from false advertisements, showing what is ethical or unethical to make things easier for everyone. Still, the Code does not discuss AI's involvement in communicating or creating ESG disclosures. These AI systems can accidentally pass on wrong or too-simplified portrayals of environmental issues if they are not well managed. Pinpointing misleading green claims from AI is a problem because the Code does not give clear instructions for monitoring online advertising. Later amendments to the Code could focus on AI-related matters by regulating automated content, checking its traceability, the responsibility of the developer, and the involvement of people in monitoring environmental data.

The Deutsche Bank[12] case settling the 2025 Deutsche Bank case was important for raising up ESG standards. Because of findings made by Reuters, DWS was fined €25 million by German authorities due to misjudging

[9] Corporate Sustainability Reporting - European Commission, https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en (last visited Jun. 7, 2025).

[10] The FCA's Anti-Greenwashing Rule, KPMG, https://kpmg.com/xx/en/our-insights/esg/the-fcas-anti-greenwashing-rule.html (last visited Jun. 7, 2025).

[11] Green Claims Code, GREEN CLAIMS CODE, https://greenclaims.campaign.gov.uk/ (last visited Jun. 7, 2025).

[12] Deutsche Bank-Owned Asset Manager DWS Fined $27 Million for Greenwashing | Reuters, https://www.reuters.com/sustainability/german-asset-manager-dws-fined-25-mln-eur-greenwashing-case-2025-04-02/ (last visited Jun. 7, 2025).

ESG factors in its investments. It pointed out that there is greater attention from regulators on ESG reporting and the problems businesses may run into when making incorrect environmental or social claims. Under the new ruling, ESG data is required to be verified and must be transparent. Officials are expecting that this practice will become even more important as new finance regulations take shape and greatly affect financial firms. However, the case did not look into what AI could do to promote greenwashing. Because AI plays a significant role in managing ESG data, writing company disclosures, and security, overlooking this development is a huge mistake. It is very important to know the role of AI in the correctness and integrity of ESG reporting. Even though DWS refers to these problems, more studies should be conducted to manage AI and ESG regulations, mainly because of uncertainties about data bias, transparency, and sustainability. Both legal issues due to Greenwashing and the lack of comprehensive ESG reporting about AI were found in this case.

In 2023, the Securities and Exchange Board of India (SEBI)[13] rolled out the Business Responsibility and Sustainability Reporting (BRSR) framework to help make ESG information more transparent among the largest publicly-listed companies in India. The BRSR requires companies to use standard methods for ESG disclosures to make sure their reports are consistent, comparable and truthful. Similar to the previous step, it tells businesses to share details that evaluate their impact on the environment, their responsible actions and how they're managed—these leads businesses to focus on sustainability in all their activities and comply with national and international ESG norms. SEBI's BRSR which includes ESG in its regulatory disclosure, shows how the country is developing its corporate governance towards better sustainability.

Even with its forward design, the BRSR platform shows certain disruptions. Most importantly, it does not include any dedicated AI-related rules, although artificial intelligence matters a lot in data management, reporting on ESG factors and developing sustainable strategies by companies. Because there are no clear rules on how to use AI ethically and responsibly in ESG activities, the framework does not address possible risks from unfair algorithms, missing data privacy or claims made by companies about their ESG performance. The framework also allows companies to benefit from greenwashing since it does not specify rules for the penalties these practices might attract. When there are no effective ways to enforce the regulation, it becomes less likely to control dishonest green advertising. Since AI will play a bigger role in ESG processes, future BRSR rules might adopt AI governance principles and enforce them properly to support greater openness and accountability.

In 2023, the U.S. Securities and Exchange Commission (SEC) introduced **Proposed ESG Disclosure Rules**[14] as a step in its aim to develop and strengthen sustainability financial disclosures. According to the proposal, public companies will be required to share the ways they handle climate-related risks, their management system for those risks and their greenhouse gas emissions which include Scope 1, Scope 2 and sometimes Scope 3 emissions. They must also outline how the risks related to climate change shape their strategy, day-to-day plans and results on the short-, medium- and long-term fronts. The intention of the rules is to make reporting clear

[13] SEBI | BRSR Core - Framework for Assurance and ESG Disclosures for Value Chain, https://www.sebi.gov.in/legal/circulars/jul-2023/brsr-core-framework-for-assurance-and-esg-disclosures-for-value-chain_73854.html (last visited Jun. 7, 2025).

[14] SEC.Gov | SEC Adopts Rules to Enhance and Standardize Climate-Related Disclosures for Investors, https://www.sec.gov/newsroom/press-releases/2024-31 (last visited Jun. 7, 2025).

and equal, give investors good data and curb cases of greenwashing and misleading information in the financial industry.

But, there is a big missing piece in the proposal: dealing with AI-related threats and the regulation of AI in ESG reporting. Soon after companies start using AI for climate risk modeling, ESG storytelling and big-data processing, queries about their accuracy, accountability and if they can be verified arise. It is not included in the SEC's proposal how AI is becoming important for sustainability reporting and guidance for regulating, validating or disclosing AI tools is also absent. This oversight worries us, since it could allow algorithms to introduce deceiving disclosures that only look correct, as they are not carefully monitored by people. AI guidance should become a part of ESG disclosure guidelines in the future, so companies using AI to report will maintain integrity.

IV. AI emergence tools and Governance frameworks

In **2025, Xu et al[15].** explain that DeepGreen is an AI-based system that was introduced to carefully review corporate ESG claims and detect any signs of greenwashing using the power of Large Language Models (LLMs). By using natural language processing, the system examines sustainability, press releases and corporate announcements to calculate a new measure called the "GreenImplement" score. The aim of this score is to find out how the company compares its ESG statements to its actual environmental operations. The authors claim that DeepGreen can audit ESG statements on a large scale, in a continuous way, to fix a major problem of not being able to verify sustainability-related communications. Advanced AI tools are meant to resolve the issues found in traditional ESG audits such as their need for manual work and being unreliable.

Its significant and technical aspects do not overshadow the study's weaknesses which reduce its usefulness right now. Especially, the system still requires independent testing across many different industries and countries. Because ESG standards, words and regulations differ greatly from one sector and region to another, it is not certain how well DeepGreen will work in different situations. In this way, features such as unique ways of speaking, technical vocabulary and different availability of ESG data may change the system's reliability or how easily its results are understood. Besides, this type of analysis expects that all necessary reporting is complete and accurate which is not always the case, especially in places where reporting laws are weak. In order to make the system more credible and useful worldwide, future studies ought to apply DeepGreen in different fields and regulations, measure it against other ESG methods and have specialists assist in developing a better scoring system.

Together, the principles of the **AI Framework developed by the OECD (2023)[16]** constitute one of the most popular standards for ethical AI worldwide. The principles are based on five important things: Inclusive growth and sustainability, human-centered values and fairness, clear and transparent communication, reliable and secure performance and being accountable. Initially made to assist national governments and businesses, the principles have recently been mentioned frequently in talks about aligning AI with ESG (Environmental, Social and Governance) principles. It's especially important for AI applications to concern ESG that they are

[15] Congluo Xu et al., DeepGreen: Effective LLM-Driven Green-Washing Monitoring System Designed for Empirical Testing -- Evidence from China (Apr. 10, 2025), http://arxiv.org/abs/2504.07733.

[16] Artificial Intelligence, OECD, https://www.oecd.org/en/topics/artificial-intelligence.html (last visited Jun. 7, 2025).

transparent and supervised by people. They are well in line with ESG values, like ethical leadership, managing environmental dangers and caring for society, mainly in the fields of automated job selection, monitoring the climate and environmentally friendly financial policies.

Even so, the OECD framework cannot be enforced and lacks binding nature, so its impact in the real world is quite limited. Governments and organizations have the option to adopt the standards which means relying on their willing compliance instead of law. It is especially difficult for those industries that depend on responsible AI, because standards, enforceable rules and ways to audit processes are needed for algorithmic bias, greenwashing or unclear supply chain management. Besides, just like their disciplines, ESG principles can be implemented in many ways, but they do not directly offer tools, guidance or strategies for each sector. As a result, the general ethical values in the OECD principles do not match the practical needs of AI systems that include ESG. For this reason, more policy work should aim to put these general ideas into terms that industries can use, by including watchdogs, reporting requirements and collaborating with other countries to ensure fairness and accountability.

Perera et al. (2024),[17] in their book AI and Ethics, introduce a framework for responsible AI that is specifically created to make AI systems follow ESG (Environmental, Social and Governance) objectives. It points out that responsible AI is key to the continued sustainability and responsibility of an organization. The essential parts of the framework are explainability, focusing on what AI decisions mean; sustainability, to see the environmental side of AI; and fairness and accountability, to stop against unfairness, discrimination or damage to society. Authors suggest that following these values can result in reliable and open ESG reports, reduced risk to reputation and unity between a company's digital developments and ethical values. This report is relevant now since companies are being urged by regulators and stakeholders to account for their environmental and social achievements as well as financial results.

Yet, the framework has not been well tested or applied in practice and is mainly theoretical. While the way it explains issues is well-structured, the lack of case studies and new versions used in practice makes it difficult to evaluate or compare what it recommends with what is done in actual cases. It becomes difficult for organizations to judge whether the framework will work well in various places, manage different sizes of companies and fit the needs of each region without proper evidence. Besides, the framework excludes rules under development, for instance, EU AI Act and ESG reporting required by the Corporate Sustainability Reporting Directive (CSRD) which affect the future of digital accountability. Another study should try to understand the issue by looking into different areas, creating tools together with people who practice governance and testing how workable the model is with current operations. In this way, organizations could apply ESG-aligned AI in their governance structure easily and in a form that could be measured.

[17] (PDF) AI and Ethics in Business: A Comprehensive Review of Responsible AI Practices and Corporate Responsibility, RESEARCHGATE, https://www.researchgate.net/publication/378548167_AI_and_ethics_in_business_A_comprehensive_review_of_responsible_AI_practices_and_corporate_responsibility (last visited Jun. 7, 2025).

III. The Role Of Ai In Enhancing Esg Disclosures

In sustainable finance, ethical business, and investment, Environmental, Social, and Governance (ESG) factors are now very important everywhere. More people are pushing for quality and broad reporting on ESG factors to measure a company's sustainability and potential threats. Since ESG is gaining attention, people are increasingly observing how well the information is provided and evaluated.

Still, ESG reporting according to traditional standards encounters major problems. There are a lot of factors in ESG, including greenhouse emissions, water, how workers are treated, diversity, human rights, and governance, which involve many kinds of information, like company reports and statistics. Since there isn't a common way to report ESG information, comparing two companies is difficult. GRI, SASB, and TCFD are frameworks that exist, but companies usually do not use them in the same way, which makes it hard for results to be smooth and unified. ESG reporting processes usually need people to collect data by hand, check it, and document the results, making it take a lot of time and leave room for mistakes. Most often, reports emphasize past achievements and rarely cover possible risks and chances coming up. This sector makes use of AI, which collects data, analyzes it, and presents results quickly. With the help of AI, tools such as NLP and ML increase the precision of ESG work, normalize many kinds of ESG metrics, and allow for easier comparison and reference.

Checking news, regulations, and social media for new ESG risks or unresolved issues, AI allows companies to know about them in real-time and take action to keep things transparent. AI systems are able to foresee future environmental and social risks, letting companies and investors react and develop solid strategies in advance. All over the world, regulators are calling for standard ESG disclosures. The BRSR framework was created by SEBI in India, the U.S. SEC is progressing with disclosure rules on climate, in the UK the FCA encourages TCFD-based reporting, and in the EU, CSRD[18] and SFDR[19] are being strictly observed for ESG reporting. AI is important for helping companies address these shifts by bringing together data, preparing reports automatically, and analyzing different situations.

To sum up, AI helps solve main ESG problems, like complicated information, unclear rules, sluggish effort, and outdated reports, by making things transparent, consistent, speedy, and informative. When the rules get stricter, AI will play a key role in making sustainable finance work and raising ESG reporting quality and effect internationally.

I. Automation and Standardization in ESG Reporting

Many different topics are covered in ESG disclosures since sustainability has many aspects in the corporate world. Some areas of environmental data are greenhouse gas emissions, water, and energy; social factors deal with working environments, diverse workers, care for human rights, and inclusion; governance refers to leadership, salary ranges, representation, and efforts to tackle corruption. Since there are so many aspects in ESG, it is difficult to collect, confirm, and report data on these topics. Before, collecting ESG information was both slow and had many gaps. Besides human resources, environmental management, investor relations, and compliance, other external consultants are recruited to gather information independently. Having so many

[18] Corporate Sustainability Reporting Directive (CSRD), Directive 2022/2464, 2022 O.J. (L 322) 15 (EU).
[19] Sustainable Finance Disclosure Regulation (SFDR), Regulation (EU) 2019/2088, 2019 O.J. (L 317) 1.

teams work independently usually causes issues with the same data still being sometimes inaccurate and not completely matching. Reporting becomes slower and less timely with manual collection since it takes more time. In addition, since there are no set standards, it becomes tough to measure how companies have performed on ESG issues, which reduces transparency.

AI is changing ESG reporting by automating the collection of information and encouraging everyone to follow a uniform process. It is now possible for both advanced ERP and IoT systems to track the real-time use of energy, the release of greenhouse gases, and water consumption. With AI, such systems can automatically get and include relevant details, which makes fewer mistakes and saves time. A lot of ESG data is published in forms such as reports, policies, articles in the media, and social media posts. It is here that NLP becomes important by analyzing texts that contain ESG elements and arranging the data for easy processing. NLP allows users to gather policies about labor rights from various reports or spot news on environmental problems in the media.

Using ML, one can discover data problems like inconsistencies or lack of data logic within many data sets. When a company's reported emissions differ from what third parties find, AI will raise the concern and help build more confidence in the disclosures. Given the fact that companies can use many ESG frameworks, along with their own ways of measuring and reporting, AI finds ways to collect and present data that follows all these standards simultaneously. Semantic tagging and ontology mapping help arrange ESG data according to regulations that outline environmentally sustainable actives like the EU Taxonomy Regulation. This aids in checking if companies comply and how they measure up to each other, making reporting on sustainability more similar and open.

Case Studies

1. The Tata Consultancy Services (TCS) are located in India. - With AI tools, TCS helps companies in India ease their collection and reporting of ESG data to meet the BRSR rules set by SEBI. With the help of AI, TCS allows clients to supervise environmental and social indicators in real time. Experts in NLP read through sustainability reports and rules to gather data that can be easily used and understood. Because of automation, manual work has dropped and companies are able to provide accurate and on-time disclosures.[20]

2. BlackRock based in the USA - One of the biggest asset managers worldwide, BlackRock, brings AI into its analytics to gather ESG data and review investment risks. Machine learning models at BlackRock help assemble data from different ESG providers, mark anything that appears inconsistent, and complete any missing information. NLP tools analyze both news and social media to find any issues or risks facing portfolio companies and provide early insights on how to handle them. Using AI, ESG specialists can match their portfolio companies' data with rules proposed by the SEC and the TCFD.[21]

3. Refinitiv operates in both the United Kingdom and countries across the globe. - To standardize information from all over the world, Refinitiv, a big provider of financial market data, uses AI and NLP. Their AI systems make data match the guidelines in SASB, GRI, and TCFD frameworks, and semantic tagging also guarantees compatibility with the EU Taxonomy. With Refinitiv, investors can rate companies using specific ESG

[20] Tata Consultancy Services ESG Reporting via AI, TCS Ltd., ESG Report 2024.
[21] BlackRock ESG AI-Enabled Risk Analytics, BlackRock, Sustainability Disclosure Report 2023.

requirements in their sectors and constantly connect to news about ESG risks, helping them comply with FCA's regulations on climate reporting.[22]

4. Deutsche Telekom is located in the European Union - The company uses AI technology to prepare complete ESG reports for all of its operations in the EU. AI tools take ESG information from a business's systems, adjust it to meet EU's Corporate Sustainability Reporting Directive (CSRD), and assign them to the categories found in the EU Taxonomy. As a result, Deutsche Telekom's reporting procedures are now more exact and produce reports that regulatory agencies and stakeholders can read and use.[23]

II. Regulatory Drivers and Legislative Context

More governments are requiring ESG reporting, which is why organizations are using AI in this area more widely. Since these regulations highlight digitalization, checkable compliance, and standardizing ESG information, companies now have more pressure to publish high-quality and transparent data. Institutions in charge of regulation are now stressing technological innovations such as AI as important tools that allow them to fulfill disclosure requirements with ease and stability.

India

- To help ensure ESG disclosures, in India it is the Securities and Exchange Board of India (SEBI) that passed important guidelines. With the introduction of BRSR in 2021, SEBI made it mandatory for the top 1,000 listed firms to give detailed information about ESG topics that cover more than 45 specific categories. Some of these areas are carbon emissions, water use, staff welfare, diversity, who is on the board, and measures to avoid corruption.[24]
- Since the BRSR covers a wide range and many details, collecting and managing all the information is very difficult for businesses that relied on manual methods. Because of this, SEBI strongly advises that advanced technologies and AI be used to speed up gathering ESG data, increase its accuracy, and meet the required deadlines.
- AI tools make it possible for Indian companies to collect and use up-to-date information from different parts of the organization and third-party sources, make all their disclosures the same, and create reports that meet Bangladesh RS regulations. The new rules are an example of India's dedication to coming up with digital practices, honesty, and reliability in ESG that follow global environmental and social standards.

USA

- The United States Securities and Exchange Commission (SEC) has moved forward to increase reporting on environmental matters. In 2022, the SEC proposed that public companies should give detailed information about climate risks, their governance models, and emissions of greenhouse gases, focusing on Scope 1, Scope 2, and also more frequently, Scope 3 emissions.

[22] Refinitiv ESG Framework & AI Tools, Refinitiv, An LSEG Business, ESG Report 2024.
[23] Deutsche Telekom, CSRD-Aligned ESG Reporting with AI, Deutsche Telekom AG, ESG Disclosure 2024.
[24] Business Responsibility and Sustainability Report (BRSR), Sec. & Exch. Bd. of India, Circular No. SEBI/HO/CFD/CMD-2/P/CIR/2021/562 (May 10, 2021).

- The proposal from the SEC points out how making ESG disclosures auditable, consistent, and comparable helps protect the interests of investors and supports the integrity of the market. For this to be achieved, data systems are needed that allow tracing and strict validation. Thanks to AI, companies can manage and tie together huge and complex data related to climate in a precise and efficient way. With the use of machine learning and blockchain in companies' systems, it becomes easier for them to confirm compliance with regulations. Therefore, the SEC's rules have a major influence on US enterprises deciding to use AI-based ESG reporting systems.[25]

European Union

- The EU has become one of the leaders by bringing in the Corporate Sustainability Reporting Directive (CSRD), which will start in January 2024. The CSRD makes it necessary for a larger number of companies to share details on ESG matters such as the environment, society, and their management frameworks.
- Among other parts, the CSRD requires all ESG reports to be published as electronic files using the European Single Electronic Format (ESEF). A digital mandate makes it important for businesses to use AI and ontology mapping to organize and share their sustainability data correctly with any reporting system. The CSRD reflects closely with the EU Taxonomy Regulation[26], which describes which economic activities are sustainable and requires more detailed and standard information to be reported.
- Using AI makes it easier for companies to automate the tagging, validating, and uploading of plenty of ESG data in line with such standards. With the ability to create machine-readable reports, ESG processes become easier to analyze for the EU, and this allows investors to access the same type and level of ESG data in many different markets.

United Kingdom

- The Financial Conduct Authority (FCA) of the United Kingdom has set up new disclosure rules aligned with the TCFD framework, meant mainly for British premium-listed companies. As a result, firms are expected to give detailed, checkable, and future-oriented reports about climate matters, including leadership, risks, and climate scenarios.
- At the FCA,[27] it is stressed that information used should be accurate, and this prompts firms to improve their online systems. At the same time, the Green Finance Strategy (2019) issued by the UK government supports the use of digital technologies and AI for better, more reliable, and clearer environmental, social, and governance (ESG) reporting. With this approach, these stakeholders join forces to help AI-based solutions become part of ESG practices.
- This is why, now more than ever, UK organizations rely on AI technology to help collect data, annotate it, and generate reports that help them fulfill all FCA requirements and follow international

[25] U.S. Securities and Exchange Commission, Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. 21334 (Mar. 21, 2022) (to be codified at 17 C.F.R. pts. 210, 229, 232, 239, and 249).
[26] EU Taxonomy Regulation, Regulation (EU) 2020/852, 2020 O.J. (L 198) 13.
[27] Financial Conduct Authority (FCA), Sustainability Disclosure Requirements and Investment Labels, CP22/20 (2022) (UK).

sustainability standards. Due to these regulations, the UK is recognized as an innovator, open, and favorable country to those invested in ESG matters.

Summary

Various global bodies agree that in order to embrace AI, ESG reporting should involve digital disclosures, guarantees of data auditability, and consistency in using different ESG guidelines. Because these laws require a lot of data that is difficult for people to handle, AI technologies are being adopted faster in ESG practices. Requiring digital, machine-readable disclosures and focusing on better and equal data have led India, the United States, the European Union, and the United Kingdom to regard AI as an important tool. The key to meeting the current and upcoming needs from the law and investors is AI's ability to collect data, label information, review its validity, and make uniform reports. Thanks to these regulations, ESG reporting is better and more reliable, and it also encourages corporations to adopt sustainable finance and good governance worldwide.

III. AI Technologies Empowering ESG Reporting

Using Artificial Intelligence (AI) in ESG reporting is possible because of a set of technologies that boost the way data is gathered, handled, checked, and examined. Thanks to such technologies, companies can update their ESG reporting, streamline the process, and keep up with what both regulators and interested groups want.

a. Natural Language Processing

NLP is now vital in ESG reporting because it helps businesses review large collections of text data that is not easily structured. A lot of the ESG details in sustainability reports, policy documents, regulatory filings, news articles, board meeting minutes, communications, and social media is in the form of explanations rather than figures. Trying to review and obtain key information from corporate documents is hard and consumes much time because regulations require greater transparency. Through NLP, machines are able to process language-based information and make it suitable for analysis.[28]

The role of NLP becomes more important as ESG rules continue to develop. GRI, TCFD, and the UN Guiding Principles on Business and Human Rights all ask companies to present information on governance, risk matters, working conditions, and human rights topics in long narrative sections. From 2024, the CSRD in the European Union demands that ESG information is provided so that it is easily understood and read by both people and computers. Because of its ties to the EU Taxonomy and the European Sustainability Standards, the CSRD highlights that NLP is needed for sorting and studying detailed reports that fit the given rules.

Thanks to NLP, companies can go through many documents searching for information on ESG. For illustration, NLP software is able to recognize details on workforce treatment, efforts to cut down on greenhouse gases, and board diversity from these reports. Data that has been taken out of the reports can be grouped, examined, and shown on ESG dashboards for purposes of management, investment, and regulation. Organizations apply NLP to get updates from news outlets, keep tabs on activities of NGOs, and check whistleblower websites so they can address any ESG risks or news quickly as recommended by TCFD standards.

[28] Tobias Schimanski, Analyzing ESG with AI and NLP (Tutorial#1): Report Analysis Towards ESG Risks and Opportunities, MEDIUM (Feb. 20, 2025), https://medium.com/@schimanski.tobi/analyzing-esg-with-ai-and-nlp-tutorial-1-report-analysis-towards-esg-risks-and-opportunities-8daa2695f6c5.

NLP is also very important in the work of outside organizations. Such analytics providers as Refinitiv and Bloomberg use NLP to study regulatory reports and corporate statements. It assists investors and asset managers in collecting, arranging, and making the same ESG data to evaluate a company's sustainability. Looking into SEC reports using NLP may highlight if a company's executives receive bonuses for reaching sustainability goals and for managing environmental risks and their supply chains. Because the SEC proposal for 2022 calls for in-depth climate risk reporting, it makes these tools more important. By analyzing conversations on the web, NLP helps analyze the attitude of people about a company's ESG work. Thanks to this loop, companies can change and respond to new demands from stakeholders and regulations as soon as they arise.

ING Group[29], a Dutch bank, demonstrates how NLP can be useful: it makes sure that borrowers follow the sustainable lending policies included in the bank's ESG risk framework. It checks the news and other reports to make sure the declarations match the promises, following all requirements of the EU Taxonomy and CSRD. In a similar way, an apparel business made use of NLP to find instances of child labor and safety threats mentioned in its policies, audits, and reviews by third parties, thus becoming compliant with UN and GRI demands and reducing its review expenses.

To sum up, NLP improves the process of working with ESG data by helping financial institutions finish their tasks faster, more precisely, and in line with rules from different countries. As a result, companies can boost their focus on ESG issues without having to hire additional employees. As it becomes more challenging to handle ESG reporting, NLP is still important for connecting written information with data, allowing companies to follow rules and prepare for what lies ahead.

b. Robotic Process Automation (RPA)

RPA helps improve ESG reporting by making it easier to handle routine tasks that follow rules. While Natural Language Processing and Machine Learning are often used for information analysis, RPA focuses on carrying out tasks just as a human would to make sure the work is fast, faultless, and always the same. Since ESG reporting includes a lot of information from different places, RPA can offer an orderly and dependable solution. ESG information is collected from inside the organization with tools and databases in finance, the environment, HR, and the supply chain, and from rules set by the government and standards from the industry. Working on the data manually and standing it together often leads to mistakes and takes a lot of time. Hex can handle this challenge by applying bots to get, check, and set data into ESG templates or dashboards. RPA bots are capable of getting carbon emissions data from IoT sensors in factories and then updating the related ESG systems. Keep n mind, bots may use government resources like the ones from the European Commission or the EPA and help avoid missing compliance updates.[30]

Experts say that organizations are expected to give GRI, SASB, and TCFD accurate and complete ESG information without delay. RPA makes it possible to collect data on energy, waste, and water regularly, which helps ensure that the records are accurate and report the same every time. To satisfy the requirements of future

[29] ING Group ESG Monitoring via NLP, ING Bank N.V., Annual Report 2023.

[30] Sustainable Banking through Robotic Process Automation: What Role Does ESG and Cognitive AI Play?, RESEARCHGATE, https://www.researchgate.net/publication/374431769_Sustainable_Banking_through_Robotic_Process_Automation_What_Role_does_ESG_and_Cognitive_AI_play (last visited Jun. 8, 2025).

regulations, such as the CSRD from 2024, this kind of automation is necessary. In the same year, SEBI introduced the BRSR in India, making it necessary for big companies to disclose information on over 45 ESG indicators. It becomes challenging and time-consuming for businesses just starting with sustainability reporting. SEBI promotes the role of technology, and businesses in India have used RPA more often to reduce work relating to data collection and the drawing up of documents. Now, ESG teams are free to concentrate on creating strategies instead of collecting information by hand.

Infosys[31] shows a successful use of RPA when it comes to sustainability. Bots were applied by the company to gather environmental statistics from all its activities worldwide, relating to energy, water, and how diverse the workforce is. It used the data from SAP, checked it against the company's ESG requirements, then transferred it to GRI and BRSR dashboards. The time it took to create reports went down by more than 50% and data accuracy rose. This also made integration with analytics solutions and audit service providers much easier, providing more benefits and readiness for auditors. As an example, a European utility company is another important case. Using RPA, it managed to efficiently combine data from environmental monitors, ERP, and compliance systems when dealing with CSRD requirements. Every day, the bots reviewed current emissions, checked against previous results and regulation, and raised alarm when any difference was found. Because of this, the company handled ESG risks more effectively and followed the principles set by TCFD for active climate risk preparation. RPA helps maintain good control over data. Bots obey certain guidelines and produce logs that help track all their activities. This becomes especially important because the SEC has proposed rules that need businesses to keep track of and disclose details on their greenhouse gas emissions, mainly Scope 1, 2, and 3. RPA collects information automatically from within the company and from external partners, ensuring a solid trace of who accessed and edited the data.

On the whole, RPA helps in ESG reporting by being efficient, accurate, and making sure companies follow the latest global guidelines. Having AI takes away some activities from staff, giving them more time for insights, plans, and new ideas, and it ensures that needed data is reliable and on time for all concerned.

c. Machine Learning (ML)

Using Machine Learning (ML), which comes from AI, has made ESG reporting more accurate, consistent, and intelligent when managing data. The collection of ESG data is generally not planned, since information can come from various systems that discuss emissions, supply chains, the diversity of boards, and the organization's role in the community. Machine learning algorithms are able to make sense of historical data and keep it organized.

Machine learning can make ESG data meet the standards set by GRI, SASB, and TCFD. GRI is designed to check how stakeholders are impacted, SASB tries to match ESG with important considerations for a company's business, and TCFD's emphasis is on risk from the climate and governance. ML picks out similarities in the data and connects them to the frameworks, which handles the rest of the details automatically for compliance. It is most important under the CSRD, as the EU's different rules require following the European Sustainability

[31] Infosys ESG Automation Case Study, Infosys Ltd., Sustainability Report 2023.

Reporting Standards (ESRS) and complying with the EU Taxonomy. Audits become more straightforward and cross-company comparisons easier, since ML helps to reduce errors and organize unprocessed data.[32]

Machine learning also helps in quality control by finding any anomalies. By examining both recent and older data, it is easier for models to spot problems such as an increase in emissions, declining diversity in the group of employees, or issues with resource usage. Because of this, reviewers can check unusual points and avoid mistakenly calling things environmentally friendly. These abilities match the SEC's latest guidelines for making sure disclosures for Scope 1, 2, and 3 emissions are credible and uniform in 2022.

More and more, ML is used by financial institutions to formulate ESG scores and manage risks. Through ML, these companies can check how sustainable businesses are by analyzing external ratings and what disclosures they make, which helps them manage their portfolios in line with the SFDR and PRI[33]. For instance, Microsoft relies on ML to follow and predict ESG data across the globe, and this aids the company in meeting GRI and TCFD standards. By using ML, Unilever can monitor its suppliers' risks, the environment, and implementation of labor rights, so it complies with the UK Modern Slavery Act, the GRI's purchasing guidance, and the CSDDD.

All in all, ML allows companies to gain valuable insights more quickly and accurately, track important metrics in real time, and study possible future action— making it important for effective and transparent sustainability goals.

d. Semantic Tagging and Ontology Mapping

When ESG reporting gets more involved, these technologies are making a bigger difference. They guarantee that ESG disclosures are understandable by computers and follow the rules of many countries and organizations. AI supports ESG data in becoming compatible with legal frameworks, so it is simpler to keep up with new regulations. The Corporate Sustainability Reporting Directive (CSRD) introduced by the EU is encouraging over 50,000 firms to give machine-readable ESG reports in line with the European Sustainability Reporting Standards (ESRS) and EU Taxonomy Regulation. All the environmental aspects should be categorized properly to identify potentially sustainable decisions.

With ontology mapping, AI helps match ESG data to recognized frameworks such as those coming from the EU, GRI[34], or SASB. It allows for seeing if a business's steps, for example, switching to renewable energy, match the need for climate change mitigation. Otherwise, the data can be semantically tagged with set labels, for instance for Scope 2 emissions or gender diversity, allowing systems and regulators to share and compare it across areas. One issue in ESG reporting is that standards are not the same. These technologies fix this problem. It was difficult for machines to read or compare traditional ESG reports because they were published as static files. Thanks to AI, records can be placed in digital form and then checked, analyzed, and evaluated

[32] (PDF) Leveraging AI and Machine Learning for ESG Data Analysis and Sustainable Investment Decision-Making, RESEARCHGATE, https://www.researchgate.net/publication/383132379_Leveraging_AI_and_machine_learning_for_ESG_data_analysis_and_sustainable_investment_decision-making (last visited Jun. 8, 2025).

[33] PRI – Principles for Responsible Investment, https://www.unpri.org/.

[34] GRI Standards, Global Reporting Initiative, https://www.globalreporting.org/.

live. As a result, companies can use internal ESG policy assessments to check how they compete against similar organizations.[35]

These tools help regulators to monitor things more efficiently. Watchdog authorities might use AI to see if self-disclosed corporate actions are in line with EU and ESRS directives, for example. Companies can also gain directly from having genders in the workplace. With AI, teams do not make as many errors because much of the reporting process is automatic and meets regulatory standards. Top-level managers get a better view of their ESG indicators in various parts of the company and around the world. SAP's Environmental, Social, and Governance (ESG) Reporting solution uses AI to help firms make reports in line with regulations using data taken from ERP and HCM systems. In the same way, the OntoCommons[36] project looks to blend ESG data from various industries by using the same sets of definitions.

In brief, using semantic tagging and ontology mapping is vital for makeup your ESG reports that comply with rules. They help companies use automation and adjust their actions to meet all legal needs as strong leaders in protecting the environment.

e. Predictive Analysis and Insight into the Future

AI-based tools are shifting ESG reporting from a mandatory need to a way to build and use strategies for the future. ESG reports have usually contained information from the past, such as emissions or the makeup of the board and workforce. Nowadays, since both regulations and what others are looking for increase, organizations are expected to prepare for future risks and opportunities.

Now, by using machine learning, businesses are able to predict challenges in ESG, upcoming changes in rules, and new trends in the market. The TCFD framework suggests that companies use scenario analysis to spot possible climate-related challenges such as harsh weather or carbon pricing threats and see how they might impact operations and results. It does this by using popular ESG figures, satellite images, trends from the economy, and new policies to predict the results of several scenarios. Climate change-related dangers faced by the supply chain are found through predictive analytics. In this case, a company can estimate how often floods happen in their raw materials' regions and their consequences. This helps when planning actions such as mixing suppliers, getting insurance, or making infrastructure stronger against climate change, and also fulfills the CSRD's requirement to examine sustainability issues.[37]

Social and governance problems are tackled with the help of AI. Using these technologies, information on possible labor violations, discrimination, or wrongdoing in companies is found in the media and on social sites. Noticing similarities with previous controversies, businesses are able to address risks before they get worse, supporting the UN's controlling approach to human rights. As an example, Unilever makes use of AI to identify ESG risks among suppliers, backed by information from satellites, weather services, and news about politics.[38] It makes it possible for the company to actively update its supply chain and meet the GRI and SASB standards.

[35] Mingqin Yu, Fethi A. Rabhi & Madhushi Bandara, Ontology-Driven Architecture for Managing Environmental, Social, and Governance Metrics, 13 ELECTRONICS 1719 (2024).

[36] OntoCommons Project, https://ontocommons.eu/.

[37] Predictive ESG: Drive Sustainability & Reduce Risk, https://www.ust.com/en/insights/the-future-of-esg-predictive-analytics-forecasting-and-simulation (last visited Jun. 8, 2025).

[38] Unilever Supply Chain ESG Monitoring via AI, Unilever PLC, Human Rights Report 2023.

Through the use of AI, BlackRock and other firms are able to project whether the companies in their portfolios are following ESG goals required by SFDR and PRI.

All in all, using predictive analytics helps ESG reporting by giving useful insights into the future. It allows businesses to make wise, secure choices, adapt to challenges, earn others' trust, and stick to requirements of greater openness and long-term planning.

IV. GREENWASHING IN AI-ESG CONTEXT

When Artificial Intelligence (AI) is included in ESG reporting, it greatly enhances how transparent and responsible companies become. Using AI in ESG reporting could help produce immediate, factual, and standard documents. On the other hand, there are some threats linked to this development. AI, if not regulated properly, may easily mislead people by making green or ethical claims that are not true.

I. The Deepening of Deception through AI

Artificial intelligence takes greenwashing further than before, allowing companies to produce lots of professional ESG reports. LLMs can allow corporations to seem responsible even if their actions aren't always right. AI may end up selecting or presenting data in a biased way, concentrating on good ESG results and avoiding discussion of problems. Most people remain unaware of these decisions since the ways data is used and algorithms work are not clear to the public. ESG scores produced by AI create more challenges as well. As scoring methods are private, regulators, investors, and the general public find it hard to understand whether they work or not. Because things are not clear, mistrust and accountability decrease. All in all, AI allows businesses to display ESG excellence by using software to create narratives, change statistics, and hide how decisions are reached. For this risk to be handled, stronger supervision, clear insights on algorithms, and ethical guidelines are needed to guide AI to truly accountable actions.

II. High-Profile Failures: ESG Misreporting in Practice

There is a rising problem of companies pretending to be greener, sometimes without purpose, thanks to the help of modern technology. In the first months of 2025, Deutsche Bank's DWS division was fined €25 million for misleading advertising of ESG standards in its products. The world is looking closer at financial crime, as seen by the same $25 million fines issued by the U.S. SEC and UK's FCA. Although technology may confuse issues, it can uncover the truth as well. Using AI, the ESG analytics firm GaiaLens[39] studied publicly available information about companies in Australia and signalized that some corporations might be practicing greenwashing. Because AI helps uncover ESG fraud and also helps companies do good, it is becoming more important. Organizations are being put under greater pressure to provide correct and clear ESG information due to AI-aided auditing. These examples prove that AI may create untrue messages about sustainability, but it can also help check businesses' actions.

[39] GaiaLens, ESG Analytics and Greenwashing Detection, https://www.gaialens.com/.

III. Evolving Regulatory Frameworks Addressing the AI-ESG Nexus

AI has become very important in ESG reporting, leading to more concerns about greenwashing that is not easy to spot. In return, regulators everywhere are increasing the regulations for businesses to prevent ESG deception, mainly aimed at misuse of AI. The European Union is in the forefront of setting ESG rules. Firms operating in the financial markets must now use standard reporting for ESG matters according to the SFDR. The objectives behind the sustainability of Article 8 or 9 investments should be displayed correctly. Any deceiving or untrue details in disclosures, whether produced by AI or people, may be seen as greenwashing under the SFDR. People are also concerned about AI systems that create biased assessments in the field of ESG.

From the middle of 2024, the Corporate Sustainability Reporting Directive (CSRD) will make things even clearer for users. Big EU companies and some larger firms coming from other countries should release audited ESG disclosures in line with the European Sustainability Reporting Standards (ESRS). Those adopting AI for ESG must present their methods as well as the results. From August 2024, AI tools related to ESG are regarded as high-risk and need to provide details about the sources of data, their energy needs, and any impact on the environment by the EU AI Act. Through the Act, it becomes necessary to deploy AI in ESG evaluation in a responsible manner.

Besides Europe, more countries are considering rules in this area. Although clear ESG rules are not yet defined in the U.S., the SEC is penalizing companies that make deceptive ESG statements. Rules are being put forward to make ESG-labeled investments clearer and ensure that AI models used for ratings are open about their information. In the UK, firms are urged by the Green Finance Strategy, TCFD, and future SDR to provide clear and detailed environmental and social information. CDEI has made suggestions for being able to explain the theories behind sustainability algorithms.

From now on, the top 1000 listed companies in India have to provide Business Responsibility and Sustainability Reports (BRSR). Even though rules in India are not as strict as those in the EU, they are now paying attention to making algorithms in the green finance sector transparent. Overall, this shows that the world is starting to understand that AI does not always hit the mark when it comes to ESG. Any new laws meant to guide AI in sustainability should develop measures to heal the loss of trust among the public and investors in this area.

IV. Monitoring, Enforcement, and Early Detection

As people pay more attention to ESG, the possibility of companies falsely showing they are environmentally responsible increases. Using AI in evaluating ESG makes it possible to detect fraudulent information and at the same time presents challenges in confirming the accuracy of corporate sustainability information. There are now many technological updates and regulatory changes meant to stop greenwashing.

In 2025, DeepGreen appeared and made a big impact in this sector. Using huge data gathered from China's financial sector, it relies on two separate language models to study ESG reports. It identifies situations when companies' actions disagree with their claims about sustainability. For example, sites like GaiaLens make companies more responsible by reviewing their ESG statements with information from different sources. They spot out any differences, enabling investors and consumers to decide carefully.

Such technologies are becoming more and more common in the work of regulators. Now, bodies such as the UK's FCA, ASIC in Australia, and the ESMA in Europe want firms to prove their ESG claims. There is a set of rules from ASIC that no advertisements can tell lies about sustainability, and ESMA establishes guidelines for using the word "green" in fund names. Even though each country is applying these methods differently, there is worldwide agreement that addressing greenwashing calls for effective policies and advanced tech.

AI is helping make ESG integrity better. AI is now helping in the detection and validation of claims, as well as in supporting regulators in enforcement, so ESG reporting becomes clearer and more honest. With continual improvements in AI, it is expected to find more dishonest acts and guarantee that investments meeting ESG standards follow sustainable principles.

V. Broader Impacts on Stakeholders and Markets

Businesses are transforming the way they talk about ESG by using AI, although this does raise important issues. If rules and supervision are lacking, there is a risk that AI reports on ESG issues are not clear enough, helping tech-driven greenwashing. This lowers the trust that investors and other stakeholders have and causes trouble in financial markets. For investors, it is very important to have ESG data that is accurate. If AI shows it has falsified or exaggerated results during a checkup, the whole field of ESG investments may lose its investors' trust. It goes against the basic principle of ESG: putting money into companies that are responsible and sustainable.

The financial regulators in India, the UK, the USA, and the EU are paying close attention to ESG disclosures as well as the AI tools that are used. Such rules as the EU's SFDR, CSRD, and AI Act are meant to guarantee that AI-based ESG reports are transparent, accurate, and responsible. Many other countries around the globe are taking steps to deal with AI's involvement in disclosures. If ESG statements made by AI do not agree with how a company actually operates, the firm may end up facing fines, harm to its reputation, and lose market confidence. On the other hand, companies that use clear AI systems show they are responsible and govern their use well, which wins the trust of both investors and the public.

Due to how AI allows complex greenwashing that is harder to catch, laws are getting tougher, auditing is getting improved, and companies are required to be more open about their practices. All over the world, nations are aware that clear regulations are required so AI does not mislead us. In the end, AI has much to offer in making sustainability reporting better, but someone needs to keep a close watch and ensure laws are in order. It is important to see that AI can help make real ESG improvements, and not only help with misleading green actions.

V. REGULATORY GAPS AND CHALLENGES

I. Lack of AI-Specific ESG Regulation

Today's regulations on AI and ESG disclosures are mostly created to address individual issues separately. While the EU's CSRD deals with making sustainability reporting consistent for businesses, the EU AI Act tries to deal with potential harmful impacts from AI-based systems. Even so, neither approach includes in enough detail the link between AI and ESG. As a result of regulatory silos, these AI systems involved in ESG reporting are not being closely watched for how they affect the information shown on sustainability. Therefore, companies have an opportunity to hide problems connected to the environment or advertise false progress, and still avoid breaking current regulations.

II. Absence of Auditability Standards

There is a serious problem because there are no widely adopted standards for auditing AI-generated ESG information. Usually, traditional financial audits require that all records are verifiable and traceable. Rather, when AI is involved, especially in cases using big language models or secret AI systems, basic standards for documentation, version information, or metadata are missing. So, we struggle to know where AI came up with its answers and if they are accurate. Without any audit trail laws, firms may use AI to emphasize or omit certain areas of their activities using data and leave no record behind.

III. Cross-Border Enforcement Limitations

Although AI and ESG are way beyond national boundaries, the systems put in place to enforce them are still limited to each country. Because the U.S. SEC looks at materiality alone and the EU at materiality and its context, it can get difficult to apply uniform oversight. Besides, numerous AI tools in ESG disclosures are created or kept in areas with loose safety rules, which makes it possible for businesses to avoid responsibility. As a result of this, following ethical policies globally is made more difficult, and both investors and regulators have more trouble finding cases of AI-enabled greenwashing.

IV. Algorithmic Accountability and Explainability

It is rare for today's AI systems to explain why they reach a certain decision automatically. Making decisions, their systems consider millions of important variables that are unclear to their developers. Because of this problem, ESG risks cannot be dealt with effectively through AI, and important sustainability information might be left out of reports. Since there are no required transparency standards, people such as regulators, investors, and members of the public cannot question how the AI is used for ESG. Therefore, AI becomes used to widely spread false or misleading greenwashing, with the explanation for decisions remaining hidden and hard for people to understand.

VI. RECOMMENDATIONS FOR LEGAL REFORM

I. Integrating ESG and AI Governance

It is important for regulators to include ESG topics directly in how they govern AI. As a result, the EU AI Act should be changed to include — as "high risk" on its list—the use of AI for sustainability reporting, calculating carbon credits, and rating businesses on their ESG measures. In addition, firms should be made to reveal how ESG-relevant AI was built, the data it processes, and its decision-making approach. It is important that companies create guidelines to make sure that the results of using ESG-related AI are clear both to people with technical skills and those without them.

II. Mandatory Audit Trails

To help trace actions and control compliance, the industry should be required to keep complete logs of how AI is applied in producing ESG disclosures. The logs ought to cover the following elements:

- The datasets that are put into the analysis or reporting process for ESG,
- The history and updates in the development of the AI model,
- Text and charts produced for disclosures.

If it is necessary, where people took action to affect fragile areas or species, those records should be included. Such records would make it possible for regulators and auditors to see the process of making sustainability claims.Also, it is necessary to build independent third-party standards for AI-based ESG tools. It should be possible for these to certify that the systems have strong ethical and environmental standards, besides the usual standards for output.

III. Global ESG-AI Reporting Framework

Because AI and ESG work across different countries, we need a single international approach as soon as possible. Because it is a part of the IFRS Foundation, the International Sustainability Standards Board (ISSB) is in the ideal setting to lead the process. A world-wide standard for reporting on ESG and AI should cover all the following aspects:

- Ways to classify and define AI-enabled ESG disclosures, Things such as fairness, bias testing, or tracking the origins of data should be considered by every algorithm.
- How AI risk assessments need to be handled in ESG situations.
- Ways AI model documentation and disclosure should occur.

When global expectations are aligned by this framework, it would bring down the number of separate regulations, keep greenwashing at bay, and ensure ESG disclosures using AI are easy to compare.

IV. Whistleblower Protections for AI-Based Greenwashing

Legislative changes should make it safer for people to uncover any AI-assisted tampering of environmental, social, or governance details. Even though these people are essential for pointing out wrongdoing with AI, they usually risk their careers and legal issues.

- Stronger protections in the legal system may be introduced.
- Ensuring that whistleblowers who report in AI/ESG fields are protected by their anonymity.
- An individual is protected for a longer period against retaliation.
- Similar financial rewards that are offered through the U.S. SEC's program.
- Teams across nations that support people blowing the whistle when their own laws are not strong enough.
- They help stop inside AI misuse before it causes problems to members of the public.

VII. CONCLUSION

The use of AI in making ESG disclosures marks a major milestone in corporate efforts to be sustainable. As more pressure is put on companies by different sources to share reliable details of their environmental and social impact, AI technologies are helping with better reporting. Using AI, it is possible to make ESG reports correct, timely, and practical in any industry or country. Nonetheless, it has become evident from this research that adopting AI in ESG reporting involves considerable issues. AI's value comes from having artificial intelligence, being complex, and working with huge amounts of data, which is why it can be easily abused. AI may be used by businesses to produce lovely ESG statements that deceptively hide their negative activities or showcase positives that did not truly happen. This gives rise to a smarter type of greenwashing that is hard for anyone to notice or monitor because it works automatically based on algorithms.

It is shown in the study that the current rules for ESG risks are diversified and still insufficient in addressing the AI-related challenges we face today. Though the European Union, the United States, India, and the United Kingdom have improved ESG reporting, they still have not fully dealt with the challenges brought by AI systems. Most regulations related to ESG do not give clear instructions on how AI should be used, checked, and managed when preparing sustainability reports. Some important matters such as checking algorithms, monitoring AI content, crossing borders for enforcement, and data transparency have not been resolved yet. Such gaps in the rules may weaken faith in the market, worry investors, and damage the future of environmentally-friendly finance. If such concerns are ignored, AI-related greenwashing might result in wrong investment decisions, fool people into believing false claims, and reduce efforts toward global climate and sustainability aims, as outlined in the Paris Agreement and UN SDGs.

To handle the risks and opportunities of AI, a strong and all-encompassing governance strategy must be adopted right away. This includes:

- Making it necessary to track every step of the process for AI-based ESG disclosures to check if the information is legitimate
- The EU AI Act describes AI-enhanced applications in the ESG field as high-risk activities and so requires their oversight to increase.
- Depending on the International Sustainability Standards Board (ISSB), making sure that each region follows the same set of ESG, AI, and reporting requirements.
- Making it possible for ESG reporting users to certify the AI tools they use to protect ethics, data security, and regulatory rules.
- Improving the protection for whistleblowers to motivate them to report AI-enabled changes in ESG communications without being punished.

Besides, the companies themselves should focus on digital responsibility by ensuring ethics are part of how AI is implemented. AI-driven ESG disclosures ought to follow the law and also genuinely show that a company is concerned about sustainability, equality, and openness. The company's decision-making structure should be prepared to guide AI use and make sure it is consistent with the company's environmental and social policies. To sum up, while AI makes ESG disclosures more efficient, accurate, and insightful, it may also cause more uncertainty, fraud, and avoidance of rules. In order for AI to bring the most advantages to ESG reporting, it should be guided by strong guidelines, ethical rules, and coordinated regulation from different nations. To avoid AI being used for trickery instead of supporting sustainability, everyone in the public and private sectors should speed up their efforts in unity. It is crucial to strengthen innovation and accountability at the same time, so ESG reporting becomes a dependable basis for the sustainable future and responsible digital investment.