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THE ROLE OF FORENSIC ACCOUNTING AND ARTIFICIAL INTELLIGENCE TO UNCOVERING GREENWASHING PRACTICES IN SUSTAINABILITY REPORTS

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ABSTRACT

This study aims to analyze the role of forensic accounting and artificial intelligence (AI) in detecting greenwashing practices using the Systematic Literature Review (SLR) approach. The study systematically reviews 15 scientific articles published between 2018 and 2025, collected from databases such as Google Scholar, DOAJ, and Research Gate, using predefined inclusion and exclusion criteria. The screening process was conducted through identification, filtering, and eligibility assessment to ensure the relevance and quality of the selected studies. The study examines previous research findings discussing the use of forensic accounting and AI in detecting indications of greenwashing, including the application of Natural Language Processing, machine learning, and text mining.

Keywords: *Artificial Intelligence; Forensic Accounting; Greenwashing; Sustainability Reports*

ABSTRAK

Penelitian ini bertujuan untuk menganalisis peran akuntansi forensik dan kecerdasan buatan (AI) dalam mendeteksi praktik *greenwashing* menggunakan pendekatan *Systematic Literature Review* (SLR). Penelitian ini secara sistematis menelaah 15 artikel ilmiah yang diterbitkan antara tahun 2018 hingga 2025, yang dikumpulkan dari basis data seperti *Google Scholar*, DOAJ, dan *Research Gate*, dengan menggunakan kriteria inklusi dan eksklusi yang telah ditetapkan. Proses skrining dilakukan melalui tahap identifikasi, penyaringan, dan penilaian kelayakan untuk memastikan relevansi dan kualitas studi yang dipilih. Penelitian ini mengkaji temuan penelitian sebelumnya yang membahas penggunaan akuntansi forensik dan AI dalam mendeteksi indikasi *greenwashing*, termasuk penerapan *Natural Language Processing*, *machine learning*, dan *text mining*.

Kata kunci: Akuntansi Forensik; *Greenwashing*; Kecerdasan Buatan; Laporan Keberlanjutan

Tanggal Masuk	Tanggal Revisi	Tanggal Diterima
17 September 2025	20 Februari 2026	13 April 2026

INTRODUCTION

Sustainability occupies an important position in current business practices, both globally and nationally. In recent years, the development of Environmental, Social, and Governance (ESG) reporting has increased significantly, as reflected in the growing number of corporate sustainability disclosures and academic publications addressing ESG issues. A bibliometric analysis conducted to examine trends in greenwashing and ESG disclosures highlights a substantial rise in global research on these topics, indicating increasing concern regarding the credibility and transparency of sustainability reporting (Sneideriene & Legenzova, 2025). However, this rapid expansion has also intensified the risk of greenwashing practices, where companies may present misleading or overly favorable environmental claims that do not accurately reflect their actual performance. Such practices can reduce the reliability of disclosed information, mislead stakeholders, and ultimately undermine trust in corporate sustainability reporting.

In Indonesia, the issue of greenwashing is gaining attention. Various studies show that sustainability reports and corporate communication strategies often make claims that do not fully reflect the actual situation, for example, regarding the reduction of single-use plastics in the retail sector or environmental programs that are only symbolic in nature (Aptasari *et al*., 2024). A study conducted by Valencia *et al*., (2021) found that greenwashing practices have a negative impact on consumer trust, brand equity, and purchase intent. Meanwhile, research by Freshtriana & Suk (2025) confirms that greenwashing has a negative impact on company value, with the effect intensifying especially when the company faces a crisis situation. Therefore, greenwashing is not only a matter of communication ethics, but also has serious consequences for the economic and reputational aspects of the company.

Previous research has examined the phenomenon of greenwashing in sustainability reporting, as well as the use of technology to strengthen trust in sustainability information disclosure. Moodaley & Telukdarie (2023) suggest that the rise in sustainability reporting has actually triggered a surge in greenwashing practices, namely, companies' attempts to present misleading environmental data to build positive perceptions. Greenwashing essentially reflects data manipulation that has the potential to harm various stakeholders, so an analytical approach is needed to identify and expose such fraudulent practices. Furthermore, (Sun, 2025) emphasized that forensic accounting has the potential to be an effective investigative tool for uncovering manipulation and misrepresentation in ESG and sustainability reporting. In addition, technological advances offer new opportunities through the use of Artificial Intelligence (AI), particularly natural language processing and machine learning approaches, which can help analyze sustainability reports, detect misleading language patterns, and identify anomalies between a company's claims and its actual performance.

With the rapid development of studies on sustainability reporting, various studies have begun to highlight the relationship between the use of technology and the application of forensic accounting as a preventive strategy against greenwashing practices. A study conducted by Wafirli *et al*., (2025) shows that the application of artificial intelligence (AI) has great potential in reducing the risk of greenwashing through the optimization of transparency, validation, and accuracy of corporate sustainability data. Furthermore, Setyaningrum & Hasanah (2025) emphasize that the

integrity and ethics of the accounting profession play an important role in maintaining the reliability of Environmental, Social, and Governance (ESG) reporting to avoid information manipulation. Meanwhile, the findings of Aji & Adiwijaya (2025) emphasize that greenwashing practices not only damage a company's reputation but also threaten long-term sustainability, making transparency in reporting a necessity. On the other hand, research by Christian & Resnika (2022) indicates that the application of forensic accounting methods can be an instrument for early detection of fraud in sustainability reporting, while strengthening accountability and public trust in the information presented by companies.

However, while previous studies have separately discussed the impact of greenwashing and the individual benefits of AI or forensic accounting, they fail to provide a cohesive mechanism that integrates these two domains. The findings from various previous studies remain fragmented and have not integrated forensic accounting approaches with artificial intelligence (AI) into a comprehensive analytical framework capable of providing real-time detection and legal accountability. This condition indicates a significant research gap regarding the synergy of technological precision and investigative auditing, which needs to be bridged through a more systematic and in-depth study. Herefore, a literature review is needed to explore the relationship between the two approaches in the context of detecting greenwashing practices, particularly in the corporate environment in Indonesia, which is currently striving to strengthen the transparency and credibility of its sustainability reporting.

Based on the research gap described above, this study aims to identify and analyze the role of forensic accounting and artificial intelligence (AI) in detecting greenwashing practices through a Systematic Literature Review (SLR) approach. To achieve this objective, the study addresses the following research questions:

1. RQ1: How do forensic accounting approaches contribute to the detection of greenwashing practices in sustainability reports?
2. RQ2: How can artificial intelligence techniques be utilized to identify misleading sustainability disclosures?
3. RQ3: How can the integration of forensic accounting and AI improve transparency and accountability in sustainability reporting?

Theoretically, this study is expected to enrich the literature by mapping the results of previous studies and offering perspectives on accounting and forensic technology in the study of greenwashing. Meanwhile, in practical terms, the results of this study are expected to provide recommendations for regulators, auditors, and companies in developing a more credible, transparent, and accountable sustainability reporting system.

LITERATUR REVIEW

Greenwashing

Greenwashing refers to the practice of companies presenting an environmentally friendly image through sustainability claims, when in fact these claims are exaggerated, incomplete, or even misleading. This phenomenon can be explained through legitimacy theory, which states that companies seek social acceptance, and stakeholder theory,

which emphasizes pressure from stakeholders to engage in responsible business practices. In the Indonesian context, various studies show that greenwashing is evident in a number of sectors, ranging from retail and banking to the consumer goods industry. Jasmine (2025) reveals that banks that actively promote ESG principles also have the potential to engage in greenwashing. Meanwhile, the findings of Aptasari *et al*., 2024) show a discrepancy between claims of reducing single-use plastics and implementation in the retail sector. The negative impact is not only felt by consumers, but also on company value. Freshtriana & Suk (2025) for example, prove that greenwashing has implications for a decline in firm value, especially when companies face a crisis situation.

Research contained in a Systematic Literature Review (SLR) by Aji & Adiwijaya (2025) also confirms that greenwashing occurs because companies seek to maintain their social legitimacy by publishing manipulative sustainability reports. The study found that regulatory pressure, public expectations, and the lack of independent audit mechanisms are the main factors driving the prevalence of greenwashing.

Forensic Accounting

Forensic accounting is the integration of accounting, auditing, and investigative skills to analyze financial information suitable for use in legal proceedings (AICPA, 2023). It focuses on identifying, recording, and extracting evidence of fraud or financial manipulation with the aim of producing valid and accountable evidence from both legal and ethical perspectives. When it was first implemented, forensic accounting was mostly used to uncover cases of financial fraud. However, as it has developed, its application has expanded to include non-financial reports, including sustainability reports. In the context of greenwashing, forensic accounting plays an important role in tracing discrepancies between company claims and factual conditions, assessing the reliability of supporting evidence, and testing the materiality of the information disclosed.

Mappiasse & Saleh (2025) emphasize that forensic accounting can strengthen the oversight function of sustainability reports through the application of evidence-based auditing principles, so that these reports do not merely serve as a means of image building, but truly reflect the operational conditions of the company. In addition, research by Setyaningrum & Hasanah (2025) underscores the importance of professional ethics in forensic accounting practice. The integrity and independence of accountants are key factors in maintaining objectivity in the evaluation of sustainability reports. They argue that without integrity and strict professional oversight, forensic accounting practices can lose their function as a tool to control greenwashing practices.

Artificial Intelligence (AI)

Technological developments have brought artificial intelligence (AI) as a new tool in efforts to detect greenwashing practices. Through natural language processing (NLP), machine learning, and text mining capabilities, AI has the potential to facilitate a faster and more consistent analysis of sustainability reports on a large scale, although its effectiveness remains dependent on the quality of the underlying data and algorithms. This technology can be used to recognize misleading language patterns, identify inconsistent recurring narratives, and detect discrepancies between corporate claims and available performance data. Research by (Wafirli *et al*., 2025) shows that AI offers significant potential for detecting greenwashing in sustainability reports. Using NLP

and supervised learning, this system can identify words or phrases that are often used to create a positive image without supporting empirical data. This study also highlights that integrating AI into forensic audit systems can accelerate the anomaly detection process and improve the accuracy of audit results. Aji & Adiwijaya, 2025 support these findings by discovering that the use of AI technology in sustainability reporting contributes to corporate transparency and audit efficiency. AI helps automate the identification of inconsistencies and facilitates the search for evidence to support sustainability claims.

Although research on the application of AI in the context of greenwashing in Indonesia is still relatively limited, at the global level this technology has been proven to help auditors improve the effectiveness and efficiency of testing the validity of sustainability claims. The integration of AI and forensic accounting is expected to create a more sophisticated, transparent, and reliable sustainability audit system.

Sustainability Report

Sustainability reports are the main instrument used by companies to communicate their Environmental, Social, and Governance (ESG) practices to stakeholders. These documents typically contain information related to environmental, social, and governance aspects, which are expected to serve as a form of public accountability. However, in practice, sustainability reports are often used as a means of greenwashing, where companies only highlight positive information and cover up negative information. Research conducted by Valencia *et al*., (2021) shows that this practice has a direct impact on the decline in brand credibility and consumer loyalty. Meanwhile, Freshtriana & Suk (2025) prove that sustainability reports that are indicated to contain greenwashing also have implications for a decline in company value. Therefore, it is necessary to strengthen assurance, audit, and independent verification mechanisms to improve the credibility of sustainability reports in Indonesia.

Based on this description, it can be concluded that previous studies have discussed greenwashing from a legal and ethical perspective, as well as its impact on consumers and company value. However, this study recognizes certain limitations, primarily its reliance on available secondary data and the rapidly evolving nature of AI technologies, which may limit the generalizability of the findings to future software iterations. Nevertheless, studies that specifically integrate forensic accounting and artificial intelligence in detecting greenwashing practices are still very rare, especially in the Indonesian context. Thus, this study attempts to fill this gap through the development of an interdisciplinary analytical framework to improve detection effectiveness while strengthening the transparency of sustainability reports.

RESEARCH METHOD

This study focuses on analyzing the role of forensic accounting and artificial intelligence (AI) in detecting greenwashing practices in the context of sustainability reporting. This focus was chosen because the issue of greenwashing poses a serious challenge to achieving corporate transparency and accountability, thus requiring a comprehensive study that examines the contributions of both approaches. This study adopts a descriptive qualitative approach using the Systematic Literature Review (SLR)

method to review and synthesize relevant previous scientific findings. This approach is considered appropriate because it provides a comprehensive overview of the development of the concept and application of forensic accounting and AI technology in the context of sustainability reporting.

The type of data used in this study is secondary data, obtained from national and international scientific articles related to forensic accounting, artificial intelligence, and greenwashing practices. Articles were collected from several academic databases, including Google Scholar, Directory of Open Access Journals (DOAJ), and Research Gate. The literature search covered publications from 2018 to 2025 using the keywords "forensic accounting," "artificial intelligence," "greenwashing," and "sustainability reports." The selected articles were peer-reviewed scientific publications, available in full text, and highly relevant to the focus of this study.

The SLR process in this study was carried out systematically through three main stages, namely collection, screening, and analysis of literature. The collection stage was carried out by searching for articles based on predetermined keywords and data sources. Next, the screening stage was carried out to ensure the suitability of the articles with the inclusion and exclusion criteria, whereby articles that were irrelevant or opinion-based were not included in the analysis. After that, the analysis stage was carried out by reviewing the content of the selected articles to identify the research objectives, methodological approaches, and main results and findings related to the topic of this study.

The collected data was then analyzed using a thematic analysis approach. Through this approach, various previous research results were grouped based on similarities in themes and main findings to identify patterns and relationships between relevant variables. The analysis was conducted by comparing the role of forensic accounting in detecting reporting fraud with the application of artificial intelligence in identifying indications of greenwashing. The results of this analysis are expected to produce a conceptual synthesis that explains the potential integration between forensic accounting and artificial intelligence (AI) in strengthening the transparency, accountability, and credibility of sustainability reporting in Indonesia.

RESULTS AND DISCUSSION

Literature analysis shows that greenwashing practices in sustainability reports still pose serious challenges to the credibility of corporate responsibility. This phenomenon takes various forms, ranging from exaggerated statements, omission of detrimental information, to the selection of data that merely benefits the company's image. For example, companies often highlight the success of using renewable energy in a small part of their production line, even though most of their operational activities still rely heavily on fossil fuels. This pattern indicates a narrative that is deliberately constructed to give a positive impression, even though the actual conditions are not as ideal as described. This conclusion is in line with research by Hossain *et al*., (2025), which highlights that greenwashing is often packaged with persuasive rhetoric, but does not fully represent the environmental reality. As a result, sustainability reporting is prone to being used as a tool for image building rather than as a means of valid accountability.

In this context, forensic accounting plays an important role as an independent monitoring mechanism that not only examines financial aspects, but also tests the consistency between sustainability claims and company operational data. The evaluation process is carried out through evidence verification, materiality analysis, and consistency review between periods. In this way, forensic accountants can assess whether the published information is truly relevant or merely an attempt to build a false image. For example, claims to reduce the use of single-use plastics must be analyzed based on their proportion to total production, not just measured based on small initiatives with limited impact. In line with the views of Mappiasse & Saleh (2025) the evidence-based audit approach in forensic accounting can strengthen the assurance function in sustainability reporting so that accountability can be applied more objectively.

Technological developments also strengthen this function. The integration of artificial intelligence (AI), particularly through Natural Language Processing (NLP), enables auditors to analyze the linguistic style of sustainability reports to detect the use of hyperbolic phrases, such as "full commitment to sustainability," which are often not supported by quantitative data. In addition, machine learning can study claim patterns from databases to identify inconsistencies between the information presented and the company's actual performance. Research by Sneideriene & Legenzova (2025), even shows the effectiveness of ClimateBERT in identifying symbolic and hyperbolic environmental claims with a high degree of accuracy. Meanwhile, text mining is useful for extracting important data from lengthy reports, such as carbon emission claims, which are then compared with external records such as national emissions data or independent audits. The combination of NLP, machine learning, and text mining can ultimately produce an early warning system that helps forensic accountants determine high-risk areas for manual investigation.

From a corporate governance perspective, greenwashing practices not only erode credibility, but also have serious financial and reputational consequences. Crumbley *et al*., (2024) show that ESG reporting can reduce investor confidence, increase the potential for litigation, and cause long-term reputational damage. In this case, forensic accountants act as governance guardians, providing recommendations to mitigate risks, strengthen internal control systems, and encourage the implementation of reporting transparency. Thus, the existence of forensic accounting not only maintains the integrity of reports but also protects companies from the negative impacts of sustainability information manipulation. The results of this study reinforce the idea that combining forensic accounting with artificial intelligence forms a powerful strategy to sharpen the exposure of greenwashing practices. Forensic accounting ensures audits are based on empirical evidence, while AI expands the audit scope through superior speed and accuracy. Integrating the two results in a more agile, impartial, and comprehensive audit mechanism. Theoretically, this expansion broadens the scope of forensic accounting from conventional finance to non-financial areas, particularly in disease reporting and sustainability audits. In practice, the results of the investigation encourage auditors, regulators, and companies to integrate AI-based technology to improve transparency. From a political perspective, regulations are needed that require independent assurance of sustainability reports, so that these reports are not merely an image-building tool, but truly reflect the actual operational conditions of the company.

CONCLUSION

The results of a systematic study using the Systematic Literature Review (SLR) method show that greenwashing practices remain a major challenge in corporate sustainability reporting in Indonesia. This phenomenon can lead to discrepancies between corporate claims and actual operational conditions, which can harm consumers and investors, as well as undermine the credibility and value of the company. Forensic accounting plays an important role as an independent monitoring mechanism to assess the reliability of information, verify the consistency of ESG claims with actual data, and evaluate the materiality of the information presented. The integration of artificial intelligence (AI), through Natural Language Processing, machine learning, and text mining techniques, enables large-scale report analysis, identification of misleading language patterns, rapid and accurate detection of inconsistencies, thereby increasing the effectiveness of forensic audits.

The synergy between forensic accounting and AI not only improves the accuracy and efficiency of greenwashing detection, but also helps companies, auditors, and regulators make credible, data-driven decisions, increase transparency, and support better governance. This research emphasizes the importance of developing an interdisciplinary analytical framework, utilizing AI technology, and implementing independent assurance and audit mechanisms to ensure that sustainability reports truly reflect the company's operating conditions. Further research is recommended to develop quantitative approaches to measuring the impact of greenwashing on company value and investor behavior, as well as to examine the application of AI and forensic accounting across various industry sectors to expand the generalizability of findings.

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