The Emerging Role of Sustainability Auditing in ESG Assurance and SDGs Achievement: A Semantic Literature Review

Ghipa Nur Suryani[1], Santika[2], Tatia Meilana Paramitha[3], Irfan Sophan Himawan[4]
[1]Accounting, Muhammadiyah Sukabumi University, ghivanurusuryani@gmail.com
[2]Accounting, Muhammadiyah Sukabumi University, santikaaa1006@gmail.com
[3]Accounting, Muhammadiyah Sukabumi University, tatiamitha@gmail.com
[4]Accounting, Muhammadiyah Sukabumi University, irfan.sophan@ummi.ac.id

Abstract
Purpose: This study aims to examine the evolution of sustainability auditing and ESG assurance through a Semantic Literature Review (SLR), addressing the fragmented conceptual development in this emerging field.
Design/methodology/approach: A Semantic Literature Review (SLR) was conducted, synthesizing recent academic publications to identify key concepts, thematic developments, research clusters, and future research directions. Semantic mapping was employed to explore relationships among sustainability assurance, ESG reporting, corporate governance, integrated reporting, auditor competence, and Sustainable Development Goals (SDGs).
Findings: The analysis reveals several dominant themes, including the evolution of assurance standards, auditor independence in ESG assurance, stakeholder trust, digital auditing technologies, and the contribution of sustainability assurance to corporate accountability. The findings suggest that sustainability auditing has become an essential governance mechanism that improves the credibility of ESG disclosures while supporting organizations in achieving sustainable development objectives.
Practical implications: The findings offer guidance for audit firms, standard-setters, and corporate boards in developing robust assurance frameworks that enhance ESG disclosure credibility. Organizations may benefit from investing in auditor competence and digital assurance technologies to meet rising stakeholder expectations for transparency and accountability.
Originality/value: This review contributes to the literature by proposing an integrated conceptual framework linking sustainability auditing, ESG assurance, and SDGs. It also highlights future opportunities for interdisciplinary research in accounting, auditing, sustainability reporting, and digital assurance, offering a comprehensive synthesis of the current knowledge landscape.
Paper type: Literature Review.
Keywords: Sustainability Auditing, ESG Assurance, SDGs, Sustainability Reporting, Audit, Semantic Literature Review.

1. Introduction

Sustainability reporting has moved from a niche, voluntary disclosure practice into a mainstream corporate activity over the past three decades. The large majority of the world's largest companies now publish sustainability or ESG information, and an increasing share embed this information directly within their annual financial reports rather than in stand-alone documents (KPMG International, 2024). This expansion in the volume of ESG disclosure has not been matched by a proportionate expansion in its verification: sustainability information remains, in many jurisdictions, largely self-declared, which limits its comparability and reliability relative to audited financial statements.

The rapid expansion of Environmental, Social, and Governance (ESG) reporting has extended the traditional boundaries of auditing beyond financial statements toward the assurance of non-financial, sustainability-related information. As stakeholders, including investors and regulators, call for credible assurance over the environmental, social, and governance performance disclosed by organizations (Alfify & Sharaf-Addin, 2026), the absence of independent assurance leaves sustainability disclosures vulnerable to greenwashing. That is, the overstatement or selective presentation of an organization's environmental and social performance, which further erodes stakeholder confidence in ESG information and heightens the need for credible, third-party verification (Free et al., 2024).

The demand for sustainability assurance has been accelerated by regulatory developments such as the Corporate Sustainability Reporting Directive (CSRD) in the European Union and the International Sustainability Standards Board's assurance standard (ISSA 5000), both of which push external assurance toward becoming a standard governance requirement rather than a voluntary practice (Venter & Krasodomska, 2024). Despite this momentum, auditing as an academic field remains fragmented, with studies scattered across accounting, auditing, management, and sustainability-science literatures using inconsistent terminology and theoretical lenses (Hazaea et al., 2022).

The credibility of ESG information carries implications that extend well beyond individual organizations. Achieving the 2030 Agenda for Sustainable Development is estimated to require several trillion dollars in additional annual investment, and closing this financing gap depends on investors and development institutions being able to trust the sustainability performance data underlying their capital allocation decisions (United Nations, 2024). Sustainability auditing and ESG assurance are therefore increasingly positioned not merely as firm-level governance mechanisms but as part of a broader accountability infrastructure connecting corporate ESG performance to national and global efforts toward the Sustainable Development Goals (SDGs) (Venter & Van Eck, 2021).

This study aims to examine the evolution of sustainability auditing and ESG assurance through a Semantic Literature Review (SLR), synthesizing recent academic publications to identify key concepts, thematic developments, research clusters, and future research directions. By employing semantic mapping, this review explores the relationships among sustainability assurance, ESG reporting, corporate governance, integrated reporting, auditor competence, and the Sustainable Development Goals (SDGs).

This paper contributes to the literature in two ways. Theoretically, it proposes an integrated conceptual framework that links sustainability auditing, ESG assurance, and SDGs achievement, addressing the fragmentation noted in prior reviews. Practically, the findings offer guidance for standard-setters, auditors, and organizations seeking greater consistency in sustainability-assurance practice. The remainder of this paper is organized as follows: Section 2 presents the literature review and conceptual development, Section 3 describes the semantic literature review method, Section 4 presents the results and discussion, and Section 5 concludes the paper with implications, limitations, and directions for future research.

2. Literature Review and Hypotheses Development

The theoretical foundations of sustainability auditing draw from multiple academic traditions. Agency Theory provides a basis for understanding the demand for assurance as a mechanism to reduce information asymmetry between organizational managers and stakeholders (Jensen & Meckling, 1976). In the context of ESG reporting, information asymmetry is particularly pronounced due to the complexity and diversity of non-financial information, making independent assurance particularly valuable (Cohen & Simnett, 2015). Institutional theory and stakeholder theory further reinforce this rationale, as bibliometric evidence shows that ESG scholarship has consistently drawn on these two theoretical bases to explain why firms respond to the legitimacy demands and informational needs of stakeholders through improved disclosure and assurance (Li et al., 2021).

Legitimacy Theory and Stakeholder Theory also provide important theoretical lenses for understanding sustainability auditing. Organizations seek assurance of their ESG disclosures to enhance their legitimacy in the eyes of stakeholders and to demonstrate their commitment to accountability and transparency. Signaling Theory suggests that organizations with strong ESG performance use assurance as a signal to differentiate themselves from those with weaker performance (Deegan, 2024; Boiral et al., 2023).

The evolution of assurance standards represents a central theme in the sustainability auditing literature. The International Auditing and Assurance Standards Board (IAASB) has developed International Standard on Assurance Engagements (ISAE) 3410 and ISAE 3000 (Revised), which provide frameworks for assurance engagements on greenhouse gas statements and other non-financial information, respectively. However, critics argue that existing standards are insufficiently adapted to the unique characteristics of ESG information, including its forward-looking nature, the use of estimation techniques, and the diversity of reporting frameworks (Hummel & Schlick, 2016; Venter & Krasodomska, 2024). This concern echoes calls for a unified auditing protocol that integrates the Global Reporting Initiative (GRI), the Sustainability Accounting Standards Board (SASB), and the IFRS Sustainability Disclosure Standards into a single, verifiable framework capable of reducing greenwashing and enhancing cross-jurisdictional comparability (Ilori et al., 2023).

Auditor independence and competence constitute a second major theme in the literature. The credibility of ESG assurance depends critically on the independence of assurance providers from the organizations they audit and their competence in evaluating complex sustainability information. Research examines the threats to auditor independence in ESG assurance engagements, including the provision of consulting services, familiarity threats, and self-review threats. Studies also investigate the competencies required for effective sustainability auditing, including knowledge of ESG issues, understanding of measurement methodologies, and skills in stakeholder engagement (Manetti & Toccafondi, 2012; Peters & Romi, 2015).

Digital auditing technologies represent an emerging theme in sustainability auditing research. Technologies including artificial intelligence, blockchain, data analytics, and remote sensing are increasingly being applied to enhance the efficiency, accuracy, and scope of ESG assurance. Research explores how these technologies can address persistent challenges in sustainability auditing, including data verification, sample selection, and the assessment of forward-looking information (Lodhia et al., 2025; Qader & Cek, 2024). Similarly, Ilori et al. (2023) propose embedding artificial intelligence-powered analytics and blockchain-based immutable data trails directly into the ESG audit process to strengthen traceability, automate anomaly detection, and support real-time assurance across both large corporations and small-to-medium enterprises.

The relationship between sustainability auditing and SDG achievement represents a critical but under-researched theme. While the literature acknowledges the potential contribution of assurance to SDG tracking and accountability, empirical evidence on the direct effects of sustainability auditing on SDG outcomes remains limited. This review identifies this gap and proposes directions for future research examining how different forms of assurance influence organizational contributions to the SDGs.

3. Research Method

This study employs a Semantic Literature Review (SLR) approach, a methodology that combines systematic literature review principles with semantic analysis techniques to map the conceptual structure of a research field. The SLR approach is particularly well-suited for sustainability auditing research, which spans multiple disciplines and uses diverse terminology (Snyder, 2019). Methodologically, this approach draws on two complementary traditions represented in the ESG literature: the transparent, stage-based screening protocol exemplified by the PRISMA-guided review of Ilori et al. (2023), and the software-assisted bibliometric mapping technique (CiteSpace-based co-occurrence and cluster analysis) used by Li et al. (2021) to trace the evolution of ESG scholarship.

The research process followed four stages. First, a comprehensive literature search was conducted using Scopus, Web of Science, and EBSCOhost databases. The search covered publications from 2020 to 2026 to capture the most recent developments in sustainability auditing and ESG assurance. Search terms included combinations of: sustainability audit, ESG assurance, sustainability assurance, non-financial assurance, integrated reporting assurance, and related concepts. Consistent with the identification phase described by Ilori et al. (2023), Boolean operators and controlled vocabulary were used to maximize recall while limiting the retrieval of tangential records.

Second, eligibility criteria were applied in a staged manner. Studies were included if they: (1) addressed sustainability auditing, ESG assurance, or related topics; (2) were published in peer-reviewed academic journals; (3) were written in English; and (4) presented empirical research, theoretical frameworks, or systematic reviews. Studies focusing solely on financial auditing without reference to ESG or sustainability were excluded. Titles and abstracts were first screened for relevance, after which full-text articles were assessed against the inclusion criteria, mirroring the identification-screening-eligibility-inclusion sequence applied in the PRISMA-based ESG auditing review of Ilori et al. (2023).

Third, semantic analysis was performed on the selected publications using text mining and natural language processing techniques. The analysis employed co-word analysis to identify frequently co-occurring terms, hierarchical clustering to group related concepts, and semantic network analysis to visualize relationships among themes. Term frequency-inverse document frequency (TF-IDF) analysis was used to identify the most distinctive terms within each thematic cluster. This procedure is conceptually aligned with the keyword co-occurrence, centrality, and burst-term detection techniques applied through CiteSpace by Li et al. (2021) to reveal research hotspots and trends in the broader ESG literature, providing a methodological precedent for treating keyword clustering as a proxy for thematic maturity.

Fourth, the identified themes and conceptual relationships were synthesized to develop an integrated framework linking sustainability auditing, ESG assurance, and SDGs. The synthesis involved iterative refinement of thematic categories through close reading of key publications and expert validation of the emerging framework. Where relevant, thematic categories were cross-checked against established ESG auditing constructs, including materiality mapping, standardized key performance indicators, and digitally enabled assurance mechanisms, as articulated in the ESG auditing framework of Ilori et al. (2023), to ensure that the resulting synthesis reflects both academic discourse and applied audit practice.

4. Result and Discussion

The semantic analysis identified five dominant themes in the sustainability auditing and ESG assurance literature. These themes reflect the evolving nature of the field and the diverse research traditions that contribute to it.

Theme 1: Evolution of Assurance Standards. The literature documents significant developments in assurance standards of non-financial information. ISAE 3000 (Revised) and ISAE 3410 have provided foundational frameworks, but research highlights the need for further standardization to address the unique characteristics of ESG information (Hummel & Schlick, 2016). Studies identify challenges including the diversity of reporting (GRI, SASB, TCFD, IIRC), the lack of assurance requirements in many jurisdictions, and the difficulty of assuring forward-looking information and qualitative disclosures. This concern echoes calls for a unified auditing protocol that integrates the Global Reporting Initiative (GRI), the Sustainability Accounting Standards Board (SASB), and the IFRS Sustainability Disclosure Standards into a single, verifiable framework capable of reducing greenwashing and enhancing cross-jurisdictional comparability (Ilori et al., 2023). Both streams of literature converge on the view that dynamic materiality mapping, rather than a one-size-fits-all checklist, is necessary to make assurance standards workable across sectors and geographies.

Theme 2: Auditor Independence and Competence. Research emphasizes that the credibility of ESG assurance depends on auditor independence and specialized competence. Studies find that assurance providers with ESG expertise provide higher quality assurance, but that independence threats are more pronounced in ESG assurance due to the emerging nature of the field and the frequent provision of consulting services by assurance providers (Manetti & Toccafondi, 2012). The findings highlight the need for enhanced professional training and ethical guidance for sustainability auditors. This is consistent with the limitations identified by Ilori et al. (2023), who found that traditional audit firms often lack the multidisciplinary expertise in environmental science, human rights law, and sustainability-specific data analytics required to conduct rigorous ESG assurance, and who call for dedicated ESG audit units and certification pathways as a remedy.

Theme 3: Stakeholder Trust and Credibility. The literature examines how sustainability assurance affects stakeholder perceptions and trust. Research finds that assured ESG disclosures are perceived as more credible by investors, analysts, and other stakeholders, and that assurance can enhance organizational reputation and legitimacy (Boiral et al., 2023). However, the effectiveness of assurance in building trust depends on the perceived independence and competence of the assurance provider, as well as the level of assurance provided. This finding is reinforced by bibliometric evidence that stakeholder theory has become a central theoretical lens in ESG scholarship, explaining why firms that respond more credibly to stakeholder demands for verified information tend to outperform less responsive peers (Li et al., 2021). It is also consistent with the stakeholder engagement mechanisms proposed by Ilori et al. (2023), which embed structured feedback loops and participatory materiality assessments into the audit process to ground assurance outcomes in the realities of affected stakeholders rather than internal assessments alone.

Theme 4: Digital Technologies in Sustainability Auditing. The application of digital technologies to sustainability auditing is an emerging but rapidly growing research stream. Studies explore how artificial intelligence can be used to analyze large volumes of ESG data, how blockchain can enhance the traceability and immutability of ESG disclosures, and how remote sensing technologies can verify environmental claims (Lodhia et al., 2025). The literature also identifies challenges, including the need for technological infrastructure, data privacy concerns, and the digital divide between developed and developing economies. Similarly, Ilori et al. (2023) propose embedding artificial intelligence-powered analytics and blockchain-based immutable data trails directly into the ESG audit process to strengthen traceability, automate anomaly detection, and support real-time assurance across both large corporations and small-to-medium enterprises. Taken together, these studies suggest that digital tools are shifting sustainability auditing from a periodic, retrospective exercise toward a continuous, real-time assurance model.

Theme 5: Sustainability Auditing and SDGs. Research examining the direct link between sustainability auditing and SDG achievement is still nascent. The literature suggests that assurance can contribute to SDG implementation by enhancing the credibility of SDG-related disclosures, improving accountability for SDG commitments, and providing stakeholders with reliable information for assessing organizational contributions to the SDGs (Peters & Romi, 2015). However, empirical evidence on the effectiveness of assurance in driving SDG outcomes remains limited. This gap is consistent with broader ESG scholarship, which has established robust links between ESG performance and economic consequences, firm value, and risk prevention, but has yet to systematically connect the assurance function itself to these outcomes (Li et al., 2021). Given that ESG performance has already been shown to function as an insurance-like mechanism against reputational and financial risk, sustainability assurance can plausibly be positioned as the credibility layer that allows this risk-prevention effect, and by extension SDG-related outcomes, to be trusted by external stakeholders.

Cross-Cutting Analysis. Cross-cutting analysis reveals several important insights. First, sustainability auditing has evolved from a niche practice to an increasingly mainstream component of corporate governance, driven by regulatory developments and stakeholder expectations. Second, the field faces significant challenges related to standardization, quality control, and the development of professional competencies for sustainability auditors, challenges that parallel the auditor-capacity, regulatory-fragmentation, and SME-access barriers documented by Ilori et al. (2023). Third, digital technologies offer transformative potential for ESG assurance but also introduce new risks and challenges, including uneven access to AI and blockchain infrastructure across large corporations and smaller enterprises.

The discussion of these findings highlights the need for continued development of assurance standards specifically designed for ESG information, enhanced professional training for sustainability auditors, and increased research on the effectiveness of assurance in improving ESG outcomes and SDG achievement, particularly given persistent barriers such as limited auditor expertise, regulatory misalignment across jurisdictions, and technological integration constraints faced by smaller organizations (Ilori et al., 2023). The findings also suggest that the future of sustainability auditing will be shaped by the interplay between regulatory developments, technological innovation, and evolving stakeholder expectations.

5. Conclusion

This study has examined the emerging role of sustainability auditing in ESG assurance and SDG achievement through a Semantic Literature Review. The analysis identifies five dominant themes: the evolution of assurance standards, auditor independence and competence, stakeholder trust and credibility, digital technologies in sustainability auditing, and the relationship between sustainability auditing and SDGs. The findings indicate that sustainability auditing has become an essential governance mechanism that enhances the credibility of ESG disclosures and supports organizational accountability for sustainable development.

The proposed integrated conceptual framework linking sustainability auditing, ESG assurance, and SDGs provides a coherent structure for understanding the interconnections in this rapidly evolving field. By situating this framework alongside the institutional and stakeholder theoretic foundations documented in the broader ESG literature (Li et al., 2021) and the practice-oriented, standards-integrating auditing framework of Ilori et al. (2023), this study bridges academic theorizing on ESG assurance with applied audit methodology, offering a more complete account of why and how assurance mechanisms build stakeholder trust and support sustainable development outcomes.

The implications of this research extend to multiple stakeholders. For standard-setters and regulators, the findings highlight the need for continued development of assurance standards tailored to ESG information, along with regulatory harmonization efforts of the kind envisioned by the International Sustainability Standards Board (ISSB) and echoed in the policy recommendations of Ilori et al. (2023). For the auditing profession, the results emphasize the importance of developing specialized competencies in sustainability auditing and ESG assurance, including multidisciplinary audit teams and structured certification pathways. For organizations, the findings underscore the strategic value of credible ESG assurance, supported by digital traceability tools such as AI-based analytics and blockchain, in building stakeholder trust and demonstrating genuine commitment to sustainable development rather than superficial compliance.

This study has limitations that suggest directions for future research. The literature review is limited to published academic sources and may not fully capture practitioner perspectives and emerging practices. In addition, because the review relies on semantic and bibliometric mapping rather than primary empirical data, the strength of the observed relationships between sustainability auditing and SDG outcomes cannot be established with the same certainty as in the quantitative, database-driven analyses used elsewhere in the ESG literature (Li et al., 2021).

Future research should conduct empirical studies examining the effectiveness of different assurance approaches, the impact of digital technologies on assurance quality, and the direct effects of sustainability auditing on SDG outcomes across different organizational and institutional contexts. Future studies could also test the scalable, tiered ESG auditing framework proposed by Ilori et al. (2023) among small and medium-sized enterprises, and extend the bibliometric mapping approach of Li et al. (2021) specifically to the sustainability assurance literature to track its thematic evolution over time.

Acknowledgement

The authors wish to express their sincere gratitude to their respective institutions for the support, resources, and academic environment that made this study possible. Appreciation is also extended to colleagues and peer reviewers whose constructive feedback and critical insights greatly strengthened the quality and clarity of this manuscript. The authors further acknowledge the broader community of scholars and practitioners in the fields of sustainability auditing, ESG assurance, and corporate governance, whose published works provided the intellectual foundation for this review. Finally, the authors are deeply grateful to their families and colleagues for their continuous encouragement, patience, and support throughout the completion of this research.

References

KPMG International. (2024). Survey of sustainability reporting 2024: The move to mandatory reporting. KPMG International. https://kpmg.com/xx/en/our-insights/esg/the-move-to-mandatory-reporting.html

Alfify, M., & Sharaf-Addin, H. H. (2026). A systematic literature review on audit quality and ESG-corporate performance: Current insights and future directions. *Sustainable Development*, 1-21. https://doi.org/10.1002/sd.70783

Free, C., Jones, S., & Tremblay, M.-S. (2024). Greenwashing and sustainability assurance: A review and call for future research. *Journal of Accounting Literature, 47*(4), 739-764. https://doi.org/10.1108/JAL-11-2023-0201

Venter, E. R., & Krasodomska, J. (2024). Research on extended external reporting assurance: An update on recent developments. Journal of International Financial Management & Accounting, 35(2), 390-428. https://doi.org/10.1111/jifm.12200

Hazaea, S. A., Zhu, J., Khatib, S. F. A., Bazhair, A. H., & Elamer, A. A. (2022). Sustainability assurance practices: A systematic review and future research agenda. Environmental Science and Pollution Research, 29(4), 4843-4864. https://doi.org/10.1007/s11356-021-17359-9

United Nations. (2024). Financing for Sustainable Development Report 2024: Financing for Development at a Crossroads. United Nations Inter-agency Task Force on Financing for Development.https://financing.desa.un.org/iatf/report/financing-sustainable-development-report-2024

Venter, E. R., & Van Eck, L. (2021). Research on extended external reporting assurance: Trends, themes, and opportunities. Journal of International Financial Management & Accounting, 32(1), 63-103. https://doi.org/10.1111/jifm.12125

Jensen, M.C., Meckling, W.H. (1976). Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure. Journal of Financial Economics, 3(4), 305–360.

Deegan, C. (2019). Legitimacy Theory: Despite Its Enduring Popularity and Contribution, Time Is Right for a Necessary Makeover. Accounting, Auditing & Accountability Journal, 32(8), 2307–2329.

Manetti, G., & Toccafondi, S. (2012). The Role of Stakeholders in Sustainability Reporting Assurance. Journal of Business Ethics, 107(3), 363–377.

Li, T.-T., Wang, K., Sueyoshi, T., & Wang, D. D. (2021). ESG: Research Progress and Future Prospects. Sustainability, 13(21), 11663. https://doi.org/10.3390/su132111663

Cohen, J., & Simnett, R. (2015). CSR and Assurance Services: A Research Agenda. Auditing: A Journal of Practice & Theory, 34(1), 59–74.

Ilori, O., Lawal, C. I., Friday, S. C., Isibor, N. C., & Chukwuma-Eke, E. C. (2023). A Framework for Environmental, Social, and Governance (ESG) Auditing: Bridging Gaps in Global Reporting Standards. Int. J. Soc. Sci. Except. Res., 2(1), 231–248. https://doi.org/10.54660/ijsser.2023.2.1.231-248

Lodhia, S., Farooq, M.B., Sharma, U., & Zaman, R. (2025). Digital Technologies and Sustainability Accounting, Reporting and Assurance: Framework and Research Opportunities. Meditari Accountancy Research, 33(2), 417–441.

Snyder, H. (2019). Literature Review as a Research Methodology: An Overview and Guidelines. Journal of Business Research, 104, 333–339.

Boiral, O. , Brotherton, M.-C. , & Talbot, D. (2024). What you see is what you get? Building confidence in ESG disclosures for sustainable finance through external assurance. Business Ethics, the Environment & Responsibility, 33, 617–632. https://doi.org/10.1111/beer.12630

Hummel, K., & Schlick, C. (2016). The Relationship between Sustainability Performance and Sustainability Disclosure – Reconciling Voluntary Disclosure Theory and Legitimacy Theory. Journal of Accounting and Public Policy, 35(5), 455–476.

Peters, G.F., & Romi, A.M. (2015). The Association between Sustainability Governance Characteristics and the Assurance of Corporate Sustainability Reports. Auditing: A Journal of Practice & Theory, 34(1), 163–198.

Qader, K.S., & Cek, K. (2024). Influence of Blockchain and Artificial Intelligence on Audit Quality: Evidence from Turkey. Heliyon, 10(9), e30166.