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The Intersection of Green AI, Digital Advertising, and Corporate Sustainability: A Systematic Review

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ABSTRACT

The growing intersection of digital advertising, corporate sustainability, and artificial intelligence (AI) is reshaping how organizations engage with consumers and communicate their environmental and social commitments. This study conducts a PRISMA-guided systematic review of peer-reviewed literature published between 2015 and 2025, with the objective of understanding how AI, particularly sustainable or “Green AI”, is influencing digital advertising strategies aligned with environmental, social, and governance (ESG) goals. A total of 19 articles were included based on clear inclusion criteria: English-language, peer-reviewed empirical or conceptual studies addressing AI, sustainability, and digital advertising. Articles were excluded if they lacked relevance to the intersection of these domains or did not meet minimum methodological standards. Five key themes emerged: AI’s transformative role in green marketing, the integration of sustainability into advertising strategy, risks such as greenwashing and ethical concerns, personalization’s influence on consumer trust and behavior, and the theoretical frameworks shaping the field. While AI enhances targeting and sustainability messaging, it also introduces challenges, such as energy consumption, ethical trade-offs, and strategic misalignment. Drawing on Stakeholder Theory and the Triple Bottom Line, this review provides a structured lens for understanding these tensions. Limitations include the novelty of the topic, limited geographic diversity, and a concentration of studies in consumer-facing sectors. Practical implications include the need for firms to align AI use with authentic sustainability commitments and for policymakers to strengthen digital ESG accountability frameworks.

INTRODUCTION

The growth in artificial intelligence (AI) has revolutionized the way businesses operate, communicate, and compete (Haleem *et al.*, 2022). Aldoseri *et al.* (2023) noted that technologies in AI, including machine learning, natural language processing, and predictive analytics, are widely implemented in industries such as marketing, finance, and healthcare, among others. This growth, however, has not been without pitfalls. Among the greatest concerns is the power consumption and environmental footprint created by large-scale AI models. For instance, training large language models can generate multiple tons of carbon footprint, and this has raised questions surrounding the sustainability of AI innovation (Iqbal *et al.*, 2025; Schwartz *et al.*, 2020). Sustainability has emerged as a business’s fundamental issue, for governments, as well as for consumers. Younas *et al.* (2023) revealed that companies are increasingly being called upon to conduct business in a manner that is environmentally friendly, socially inclusive, and economically viable. These demands paved the path toward corporate sustainability strategy, which seeks to balance profit with the demands of society and the environment (Barbosa *et al.*, 2023). Incorporating sustainability within business processes is no longer a choice. It is currently a strategic imperative for long-term success and trust from stakeholders.

Digital advertising has become a part of modern business strategy. Using digital media including social media, search

engines, and websites, help companies generate visibility in a global audience with targeted and data-based content (Dwivedi *et al.*, 2021). The digital advertising industry is projected to grow to over \$600 billion by 2027 (Statista, 2025), reflecting the prominence of digital advertising in corporate communications. Pärssinen *et al.* (2018) also observed, however, that the digital advertising sector is also energy-intensive, notably in data storage facilities, tracking mechanisms, and real-time bidding software. With businesses utilizing AI-powered ad-targeting and optimization technology, the environmental impact of digital advertising is mounting (Le Poidevin, 2025). This developing contradiction between digital innovation and sustainability has led to the concept of “Green AI.” Green AI is the application and creation of AI technologies that are both efficient and eco-friendly. The aim is to decrease the environmental footprint of AI systems without compromising or even enhancing effectiveness (Bolón-Canedo *et al.*, 2024). Green AI is particularly applicable in digital advertising, where energy-hogging AI algorithms help gather, analyze, and act on consumer information (Schwartz *et al.*, 2020). Integrating Green AI in advertising strategy can assist companies in reducing environmental degradation, achieving sustainability targets, and evading reputational hazards like greenwashing.

Despite increasing demand for Green AI and sustainability, scholarly research that bridges the two with digital advertising is, as yet, largely underexplored.

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Research tends to address either AI and sustainability or AI in advertising, but not the triad of Green AI, digital advertising, and corporate sustainability. This gap in the extant literature hinders understanding by scholars and practitioners of opportunities, challenges, and best practices for this intersection point. It also constrains companies from formulating clear-cut strategies that can leverage digital innovation with environmental and social responsibility. A systematic review can help bridge the gap. A systematic review is a scientific approach for

collating, summarizing, and synthesizing evidence on a targeted topic (Avenali *et al.*, 2023).

Objectives of the Study

1. To examine how Green AI is being adopted in digital advertising for corporate sustainability.
2. To determine the benefits and risks of adopting Green AI for marketing efforts.
3. To explore theoretical and practical models that promote sustainable digital advertising.

Table 1: Summary of Key Terms and Definitions

Term	Definition	Source / Notes
Artificial Intelligence (AI)	The simulation of human intelligence processes by machines, particularly computer systems, including learning (machine learning), reasoning, and self-correction.	Maguire & White (2025)
Green AI	A subfield of AI that emphasizes energy-efficient, environmentally responsible approaches to AI model training and deployment, balancing performance with ecological impact.	Yigitcanlar <i>et al.</i> (2021)
Digital Advertising	The use of digital channels (e.g., search engines, social media, email, and websites) to promote products and services through targeted, data-driven campaigns.	Dwivedi <i>et al.</i> (2021)
Sustainability	Meeting the needs of the present without compromising the ability of future generations to meet their own needs, encompassing environmental, social, and economic dimensions.	Kuhlman and Farrington (2010)
Sustainable Marketing	Marketing that not only meets organizational goals but also promotes environmental and social well-being, aligning brand and product strategies with sustainability principles.	Jia <i>et al.</i> (2023)
Greenwashing	The act of misleading consumers regarding the environmental practices of a company or the environmental benefits of a product or service.	Dalhoun <i>et al.</i> (2024)

Theoretical Framework

This review is guided by two theoretical frameworks: The Triple Bottom Line (TBL) and Stakeholder Theory. These provide a perspective on how organizations can make sustainability central to digital and AI-based business activities without compromising on responsibility to multiple stakeholders.

Triple Bottom Line (TBL)

The Triple Bottom Line concept, developed by Elkington (1997), suggests that companies measure not just economic returns, but also environmental and social performance. These dimensions (people, planet, and profit) are the basis for sustainable business practices (Nogueira *et al.*, 2025). In digital advertising and the use of AI, TBL considers whether the application of cutting-edge technologies supports or negates sustainability. For instance, advertising applications that use AI can maximize the efficiency of marketing and customer access (profit), but must also be assessed for climate impact (planet) and proper use of personal data (people). Some studies covered in this review indicate that companies are using AI for promoting green products and raising awareness

for sustainability (e.g., Salehzadeh *et al.*, 2024; Bashynska, 2023). Others identify worries relating to over-reliance on customer data, transparency, and the energy consumption of machine learning models (Rathore, 2018; Hammami, 2025). The system encourages companies to implement Green AI that reduces environmental degradation alongside fulfilling economic and social objectives. It also encourages digital marketers to prioritize longer-term strategy sustainability, and not just performance in the short term.

Stakeholder Theory

Stakeholder Theory, as established by Freeman (1984), highlights that organizations owe a responsibility to all parties who are affected by their actions. These include shareholders, customers, workers, society, and the environment (Awa *et al.*, 2024). The theory particularly comes into relevance in sustainability-oriented digital marketing, where transparency, trust, and interaction are paramount. Research has documented how digital advertisements can help connect to customers with a sense of ethical and environmental cause (e.g., Winarto & Wisesa, 2024; Gündüzyeli, 2024). AI facilitates targeted

messaging that can directly address such concerns. To illustrate, personalized ads showing cruelty-free, low-carbon, or recyclable goods prove particularly influential with Gen Z and value-oriented audiences. Stakeholder Theory explains such trends through the lens of inclusivity as well as accountability. It lends support to the notion that advertising with digital media not only sell goods but also represents and respects stakeholder expectations. This theory also supports the desirability of organizational alignment, so that internal actions as well as external communication match. If a firm tells a story of sustainability in advertisements but engages in questionable AI methods or conceals excessive emissions, it stands to misplace stakeholder trust. In addition, Stakeholder Theory underpins ethical debates surrounding the use of AI. It highlights concerns such as data privacy, algorithmic fairness, and the digital divide (Miller, 2022; Radanliev, 2025). These concerns become even more critical as business increases the use of AI to collect insight as well as automate advertising functions. These two theories lend a robust conceptual basis to the evaluation in the studies reviewed. TBL informs the evaluation of environmental and social impacts, and Stakeholder Theory ensures that the interests and rights of interested groups are taken into account. These frameworks enable researchers and practitioners not only to examine if AI-based digital advertising is successful, but also whether it is sustainable, ethical, and inclusive. As demonstrated by this review, the intersection of Green AI, digital advertising, and sustainability is in a developmental stage. These theories offer both a diagnostic tool as well as a strategic guide, allowing organizations to match digital innovations with appropriate business approaches.

MATERIALS AND METHODS

The current study applied a systematic review in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page *et al.*, 2021). PRISMA is a system that provides a structured protocol for executing systematic reviews with comprehensive coverage and methodologic rigor. It guides the systematic search, analysis, and synthesis of the literature, providing a transparent and clear approach for summarizing earlier studies (Moher *et al.*, 2010).

Systematic Review Protocol

The PRISMA protocol was followed in the systematic review, involving the following four steps:

- Identification: Searching relevant academic databases using predefined keywords.
- Screening: Removing duplicate records and screening titles and abstracts.
- Eligibility: Assessing full-text articles against inclusion and exclusion criteria.
- Inclusion: Selecting final studies that matched all criteria for detailed analysis.

The results section is accompanied by a PRISMA 2020

flow diagram, summarizing the process.

Databases searched

The databases selected for the search for this study included the well-known and highly cited databases (Google Scholar, Scopus, and Web of Science). These databases were selected given that they comprehensively cover peer-reviewed scholarly articles in a broad array of disciplines (Martín-Martín *et al.*, 2018).

Inclusion and Exclusion Criteria

To ensure the quality and relevance of selected studies, the following criteria were applied:

Inclusion Criteria

- Published between 2015 and 2025
- Written in English
- Peer-reviewed articles, conference papers, or book chapters
- Focused on at least two of the following: Green AI, digital advertising, corporate sustainability
- Empirical or conceptual studies with clear applicability to sustainable marketing practices

Exclusion Criteria

- Non-English publications
- Studies unrelated to AI, sustainability, or digital advertising
- Articles lacking abstract or full text
- Editorials, opinion pieces, or non-academic sources
- Studies focused purely on technical AI performance with no sustainability or marketing implications

Search Strategy and Keywords

A systematic keyword strategy was developed and applied across all three databases. Boolean operators (AND, OR) and truncation techniques were used to capture variations in terminology.

Search strings used included

- “Green AI” AND “digital marketing” AND “sustainability”
- “Artificial Intelligence” AND “corporate sustainability” AND “advertising”
- “Energy-efficient AI” OR “low-carbon AI” AND “marketing strategy”
- “Sustainable advertising” AND “AI tools”
- “Responsible AI” AND “brand communication”

Keywords were adapted slightly based on the syntax and advanced search functions available in each database. Filters were applied to limit results to the publication period of 2015 to 2025 and to English-language publications.

Screening Process

A total of 324 records were initially identified from three academic databases: Scopus (n = 103), Web of Science (n = 87), and Google Scholar (n = 134). After removing 47

duplicate entries and 4 non-English papers, 273 records remained for title and abstract screening. From these, 197 were excluded due to irrelevance. Of the remaining 76 reports sought for retrieval, 5 could not be accessed. The remaining 71 full-text articles were assessed for eligibility, out of which 52 were excluded. Finally, 19 studies were included in the final synthesis. The study selection process is summarized in Figure 1.

Quality Assessment

A quality appraisal was carried out for all 19 included studies to ensure academic rigor and relevance. The appraisal followed a structured checklist based on criteria

adapted from Tranfield *et al.* (2003) and the Joanna Briggs Institute (JBI). To ensure the academic rigor and relevance of the included studies, a structured quality assessment was conducted using five criteria: clarity of research aim, appropriateness of methodology, relevance to the review themes, transparency in data collection and analysis, and theoretical or practical contribution. Out of the 19 studies, 15 had a rating as high quality, and 4 had a rating as moderate quality. This step ensured that the reliability of the findings from the review was reinforced and that only conceptually and methodologically sound studies guided the thematic synthesis.

Data Extraction and Synthesis

Table 2: Quality Assessment of Included Studies

No.	Study	Clear Research Aim	Appropriate Methodology	Relevance	Transparency	Contribution	Overall Quality
1	Akshita <i>et al.</i> (2024)	✓	✓	✓	✓	✓	High
2	Kumar <i>et al.</i> (2025)	✓	✓	✓	✓	✓	High
3	Baruno & Indrasari (2025)	✓	✓	✓	✓	✓	High
4	Nianko & Andrushkevych (2025)	✓	✓	✓	✓	✓	Moderate
5	Emon & Khan (2025)	✓	✓	✓	✓	✓	High
6	Saadi & Azdimousa (2024)	✓	✓	✓	✓	✓	Moderate
7	Dalhoum <i>et al.</i> (2024)	✓	✓	✓	✓	✓	High
8	Hammami (2025)	✓	✓	✓	✓	✓	High
9	Salehzadeh <i>et al.</i> (2024)	✓	✓	✓	✓	✓	High
10	Keke (2023)	✓	✓	✓	✓	✓	Moderate
11	Ahn (2025)	✓	✓	✓	✓	✓	High
12	Hamamah <i>et al.</i> (2024)	✓	✓	✓	✓	✓	High
13	Gündüzyeli (2024)	✓	✓	✓	✓	✓	High
14	Alkhatib <i>et al.</i> (2023)	✓	✓	✓	✓	✓	High
15	Boza <i>et al.</i> (2025)	✓	✓	✓	✓	✓	High
16	Rai & Pandey (2025)	✓	✓	✓	✓	✓	High
17	Rathore (2018)	✓	✓	✓	✓	✓	Moderate
18	Bashynska (2023)	✓	✓	✓	✓	✓	High
19	Winarto & Wisesa (2024)	✓	✓	✓	✓	✓	High

The data from the included studies were systematically extracted using a standard data extraction form. For every article, essential details were captured, including the year, author(s), study title, journal or source, objectives and questions stated, approach taken, and main findings as presented in Table 3. Particular attention was given to the study's relevance to the three core domains of this review. This extracted information was organized into a structured matrix to enable effective cross-study comparison and thematic grouping. The synthesis process followed an inductive approach, allowing themes to emerge naturally from the data as patterns and relationships across the studies were identified.

Thematic Synthesis Approach

This thematic structure was developed iteratively as patterns emerged from the extracted data. An inductive

thematic analysis was used to categorize the studies into five major themes:

- AI-Driven Transformation of Green Marketing
- Strategic Integration of Sustainability into Digital Advertising
- Challenges and Risks in AI-Supported Sustainable Marketing
- Consumer Engagement, Brand Trust, and Personalization
- Theoretical Models and Frameworks Guiding the Field

Ethical Considerations

The study is solely based on published secondary data. Personal data and participants were not included. All the sources used are referenced appropriately. Hence, no ethical approval was necessary.

Findings and Thematic Synthesis

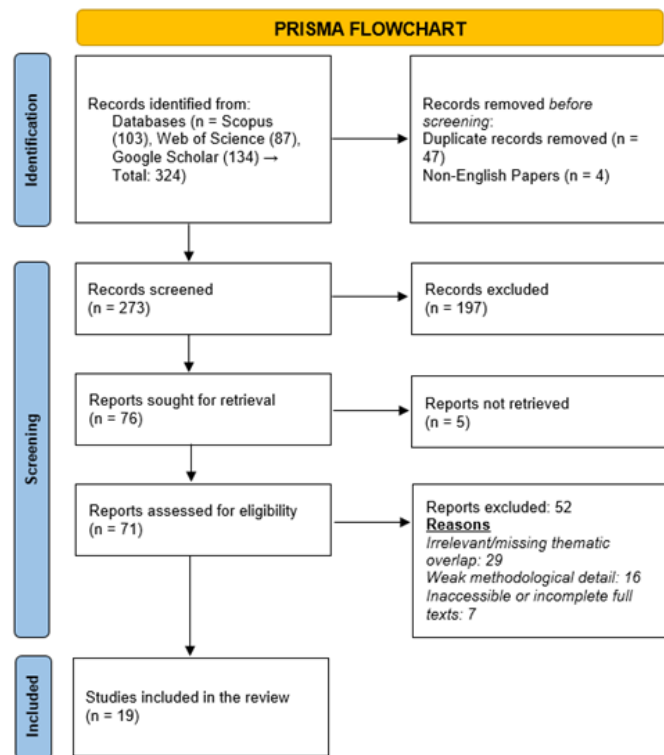


Figure 1: PRISMA Flow Diagram

Source: Page et al. (2021)

Table 3: Summary of Included Studies

Author(s)	Year	Methodology	Focus Area	Key Findings / Contribution
Akshita et al.	2024	Review & conceptual model	Green marketing & digital branding	Highlights the importance of integrating green values in brand positioning and digital marketing strategies.
Kumar et al.	2025	Systematic literature review + topic modeling (LDA)	Green AI, sustainable marketing	Identifies key themes in sustainable digital marketing and proposes a TCM framework for future research.
Baruno & Indrasari	2025	Case study	AI-driven advertising	Shows how AI improves advertising effectiveness and contributes to green strategy in consumer campaigns.

Nianko & Andrushkevych	2025	Conceptual analysis	AI tools in marketing	Discusses the role of Green AI tools in achieving environmental goals through data efficiency.
Emon & Khan	2025	Systematic review	Sustainability + AI in marketing intelligence	Explores the dual role of AI in enhancing marketing efficiency and addressing ethical sustainability goals.
Saadi & Azdimousa	2024	Case-based study	Digital advertising and green branding	Discusses the role of AI-driven content in promoting sustainable brand images.
Dalhoum <i>et al.</i>	2024	Mixed methods	Green digital marketing	Evaluates how digital marketing campaigns influence consumer behavior toward green consumption.
Hammami	2025	Theoretical discussion	Green marketing + organizational change	Emphasizes the need for holistic integration of sustainability in digital strategies to avoid greenwashing.
Salehzadeh <i>et al.</i>	2024	Survey (Quantitative)	Sustainable brand equity	Demonstrates that digital sustainability initiatives strengthen brand equity among environmentally conscious consumers.
Keke	2023	Qualitative analysis	Ethical advertising & environmental impact	Discusses the relationship between ethical marketing strategies and environmental awareness.
Ahn	2025	Conceptual framework	AI & consumer engagement	Proposes a digital engagement model incorporating sustainability values through personalized AI marketing.
Hamamah <i>et al.</i>	2024	Empirical analysis	Smart city sustainability & digital tools	Examines smart technologies in digital urban marketing and their role in public sustainability communication.
Gündüzyeli	2024	Mixed methods	ESG & green digital policy	Evaluates how digital tools support corporate ESG communication and performance monitoring.
Alkhatib <i>et al.</i>	2023	Conceptual + content analysis	Digital and green marketing synergy	Highlights the emerging convergence of green and digital marketing as a strategic business opportunity.
Boza <i>et al.</i>	2025	Systematic review (PRISMA)	Sustainability & digital strategy	Analyzes how digital marketing aligns (or fails to align) with corporate sustainability and organizational culture.
Rai & Pandey	2025	Conceptual	AI in sustainable ad campaigns	Discusses the use of AI for targeting sustainability-focused consumer segments.
Rathore	2018	Theoretical	AI, sustainability & metaverse	Explores the convergence of AI and green marketing in the metaverse as a future business frontier.
Bashynska	2023	Mixed methods	AI personalization & circular economy	Evaluates AI-driven personalization in advertising and its link to sustainable consumer behavior.
Winarto & Wisesa	2024	Survey (Quantitative)	Gen Z, AI & sustainability	Assesses how AI and eco-practices affect Gen Z's purchase intention in the cosmetics sector.

This section offers a synthesis of the identified themes that emerge from the intersection of Green AI, digital advertising, and corporate sustainability. The thematic synthesis reveals five main themes: AI-powered green marketing transformation, strategic integration of sustainability in digital advertising, challenges and pitfalls in AI-assisted sustainable marketing, consumer trust and brand involvement, and developing theoretical

and strategic frameworks. These themes reflect the promise and challenges in relating AI technologies to environmental and ethical marketing goals.

AI-Driven Transformation of Green Marketing
Artificial Intelligence (AI) is revolutionizing the practice of green advertising through increased automation, personalization, and optimization of data. AI facilitates

green messaging with unparalleled accuracy and scale, as well as enhancing campaign performance. AI technologies like machine learning, natural language processing, and predictive analytics allow for the segmentation of green-oriented customers in real-time. This enable companies to customize messaging by environmental values and attitudes (Baruno & Indrasari, 2025). AI functions aid in optimizing resources by eliminating ad waste and guaranteeing best targets hit, aligning performance with sustainability objectives.

The literature points to AI as a central enabler for green content personalization for sustainability-seeking consumers. Saadi and Azdimousa (2024), for example, illustrated how content facilitated by AI can help enable green positioning for a brand by reflecting green values in promotional content as well as in customer experience. Bashynska (2023) also illustrated that AI personalization helps in sustainability not through improved customer engagement, but also by facilitating consumption behavior in conformity with the circular approach to the economy. AI-based systems can leverage behavior data to determine eco-aware consumers and provide them with goods or services that help in waste reduction, emission reduction, or reduced consumption. In addition, Kumar *et al.* (2025) pointed out that AI facilitates large-scale marketer insight through green consumer trend identification. Using 2,061 publications on a topic modeling application, they illustrated that AI-based marketing is moving toward a central enabling role for corporate sustainability strategies. Environmental, social, and corporate governance (ESG) data processing in real time also enables marketers to directly incorporate sustainability metrics in digital campaign planning. This opens doors for increased visibility and data-informed sustainability narratives that increase credibility and trust with stakeholders.

The role of AI in green marketing also goes beyond the optimization of campaigns. Algorithmic adjustments in digital advertising placement occur in real-time. This can be user feedback, device power consumption, or local environmental regulations. For example, Rathore (2018) suggested that prescriptive AI can customize promotional content in emerging digital spaces such as the metaverse in a manner that sustainability is a primary element even in simulated environments. This point indicates that green marketing transformation by AI is not merely technical but strategic. It contributes to companies moving away from symbolic green messaging to measurable environmental contributions. Adding intelligence to environmental practice integrates awareness into sustainability, allowing organizations to translate digital performance into ecological responsibility. This is value for environmental, economic, and consumer stakeholders.

Integrating Sustainability Strategically into Online Advertising

The embedding of sustainability in digital advertising requires a long-term cultural transformation in the

organization, a buy-in by the leadership, and policy alignment. Boza *et al.* (2025) believe that digital sustainability needs to be incorporated into the central strategy of a business. They established that numerous businesses acknowledge the value of sustainability, but in practice, the integration is usually shallow. Inconsistent messaging and greenwashing could result from a lack of alignment between digital advertising practices and wider corporate sustainability objectives. Organisational culture, especially leadership direction and staff involvement, should focus on making digital sustainability a lived experience and not a branding initiative.

Akshita *et al.* (2024) validate this viewpoint with supporting evidence that brand identity is being shaped by digital marketing practices centered on environmental responsibility. The study finds that sustainability must be woven into brand narratives through intentional and repetitive efforts with a long-term strategic vision. Sustainable values can be propagated through digital channels, but they need to be integrated into the business framework, not done for the sake of consumer acceptance. Hammami (2025) also explores how internal reform can help make digital changes sustainable. The study believes that integrating sustainability into digital strategy is a multi-level approach. This involves picturing a different infrastructure, investing in low-carbon technologies, and cultivating a mindset change among marketers. The study underlines that sustainability integration cannot be done from outside; it needs to be part of a grander vision with leadership and cross-functional coordination. In another similar discovery, Gündüzyeli (2024) explores the realization and communication of corporate ESG strategy through digital media. The study finds that various organizations make use of dashboards, social media, and reporting websites to align digital marketing with ESG disclosures. It also finds that in the absence of policy coordination and a system for internal responsibility, the digital media can become mere signaling devices.

AI-Supported Sustainable Marketing: Challenges and Risks

Despite AI being a promising instrument for encouraging sustainability through digital advertising, there are several risks confronting it. Using AI for greenwashing is one such risk. Dalhoum *et al.* (2024) discuss that as digital advertising goes on to become even bigger, so does the risk of making false statements about sustainability. These authors mention in a study that when organizations take up AI-powered campaigns that promise a green image without supporting it with real practice, consumer trust is lost. Discrepancy between promise and practice can cause loss of reputation as well as a backlash from regulations, undermining actual sustainability efforts.

Gündüzyeli (2024) continues by spelling out the ethical dilemmas in ESG policy driven by digitalization. The article highlights that there are companies that apply AI-based solutions such as dashboards and reporting systems that leverage the use of automation to present

ESG performance, yet with weak internal controls in place, such systems may be able to cover up performance vulnerabilities. The digital divide, where some companies may be able to leverage powerful AI solutions but others cannot, is also a concern for equity in sustainability reporting. The study also identifies a lack of transparency in algorithmic logic and procurement as a barrier to ethical communication.

Another central problem is energy consumption. Rathore (2018) raises the environmental costs imposed by adopting AI for green marketing. The article cites that the solutions may streamline message delivery and personalization. This will support hardware such as cloud servers and GPU-based processes, which commonly consume a lot of power. This is a paradox as the solutions that promote sustainability end up having a large carbon footprint, particularly when applied in immersive environments such as the metaverse. In addition to environmental and ethical difficulties, cultural or functional resistance is another strategic hindrance. Hammami (2025) observes that organizations often make green AI solutions without addressing underlying cultural or functional inertia. Without buy-in from top leadership and from the employees, AI deployment can be cosmetic and ineffective in generating meaningful sustainability outcomes.

Consumer Engagement, Brand Trust, and Personalization

AI-powered digital advertising is a prime mechanism for consumer engagement and building brand equity in sustainability-oriented markets. Various studies examine and describe the impact of AI and sustainability practices on consumer attitudes, behavior, and long-term trust. Winarto and Wisesa (2024), in a case study among Gen Z consumers in Indonesia's cosmetics industry, established that AI-powered technologies substantially augment hedonic and utilitarian value with personalized, green experiences. These results validate that sustainability-oriented AI applications not only enable purchase intent but also enhance brand credibility and loyalty among young, sustainability-oriented consumers.

Bashynska (2023) also points to AI personalization as a catalyst for consumer sustainability. The results prove that personalization at scale through advertisements driven by AI can align product supplies with those of a circular economy. By showcasing content that aligns with consumer values (e.g., less-wasteful packaging, ethical sourcing), brands can gain a higher emotional connection and position themselves as credible actors for sustainability. This personalization is not even limited to convenience but includes educational as well as advocacy components, allowing consumers to make well-informed, responsible shopping decisions.

Salehzadeh *et al.* (2024) also state further that digital sustainability strengthens brand equity. Through their empirical evidence, they illustrate that with companies including environmental responsibility in ad content

backed by transparent, AI-derived metrics, consumers see such brands as more reputable and trustworthy. This trust further promotes emotional bonds and advocacy behaviors. Ahn (2025) offers a theoretical approach, suggesting a model that coordinates AI-facilitated digital experience with consumer identity and eco-brand fit. The argument is that by integrating sustainability into the tailored digital experience, it becomes a part of the lifestyle of the consumer, strengthening both short-term conversions and long-term loyalty.

Theoretical and Strategic Frameworks Guiding the Field

There has emerged an increasing volume of scholarship that defines theoretical and strategic models to explain and facilitate the integration of Green AI, ESG goals, and digital advertising. Among these is the effort by Kumar *et al.* (2025), who leveraged Latent Dirichlet Allocation (LDA) topic model over 2,061 papers to create a Thematic-Consolidated Model (TCM). This model categorizes the emerging discipline of green digital marketing into thematic pillars such as green innovation, ethical application of AI, consumer ethics, and corporate transparency. This framework offers a guide for scholars and practitioners to map AI-powered advertising practices to long-term sustainability goals.

This is expanded upon by Ahn (2025) through a proposed conceptual framework linking digital consumer interaction directly with AI personalization and sustainability values. In the model, it is suggested that when AI technology is applied not just for commercial personalization, but also for advancing eco-friendly decision making, they form a "green engagement loop." This incorporates brand messaging with personal consumer identities, building long-term brand sustainability and consumer loyalty alignment. Here, personalization is not merely a promotional instrument, but also a behavior change medium for promoting green consumption.

Emon and Khan (2025) take a wider strategic perspective in their systematic review of sustainability and AI in marketing intelligence. They offer no specific named model, but in synthesis they highlight the need for the application of AI to be aligned with SDGs and ethical governance standards. They advocate a far more cohesive, cross-functional approach that incorporates data ethics, energy efficiency, consumer trust, and long-term brand strategy in one sustainability-oriented AI paradigm.

These studies form the basis for theory-informed knowledge on sustainable digital marketing. They provide frameworks that consolidate disparate activities in sustainability, AI, and marketing, steering future corporate and scholarly action toward coherent, quantifiable objectives.

RESULTS AND DISCUSSION

The results from this review indicate that, whilst the use of AI in sustainable digital marketing is increasing, efforts has been inconsistent and evolving. The two theoretical

perspectives: Triple Bottom Line (TBL) and Stakeholder Theory provide a framework for understanding how companies are navigating the intersection between Green AI, advertising, and sustainability. In line with the TBL approach, AI enhances economic efficiency (e.g., campaign optimization), but environmental gains are less evident due to the carbon footprint of AI systems (Rathore, 2018). Social performance, exemplified by AI-driven personalization in sync with environmentally aware consumer values, is promising (Bashynska, 2023; Winarto & Wisesa, 2024), but raises questions around privacy (Dalhoum *et al.*, 2024). Stakeholder Theory highlights that organizations leverage AI to connect with a greener consumer base, but they fail to track internal misalignments between sustainability messaging and business practice (Boza *et al.*, 2025).

Compared to previous literature, this review provides a more targeted focus on Green AI and its link to digital advertising. Earlier reviews, such as those by Dangelico and Vocalelli (2017) and Tuz and Sertyeşilşik (2022) on green branding, rarely consider AI's strategic role. Likewise, the broader field of AI ethics often omits digital marketing's environmental dimension. This review bridges that gap by focusing on how AI tools enable, and sometimes undermine, credible sustainability messaging. Practically, the findings suggest that digital marketers must do more than adopt sustainable messaging. They must embed sustainability into data strategies, platform selection, and content personalization. Firms should apply green computing principles and invest in energy-efficient AI models. Policymakers must regulate digital green claims to avoid misleading practices and incentivize low-carbon digital technologies.

However, organizations face trade-offs. AI offers marketing efficiency but may increase emissions unless properly managed. Highly personalized sustainability content may boost engagement but raise privacy risks if not governed by transparent data ethics policies (Gündüzyeli, 2024). Balancing these goals requires cross-functional leadership and investment in infrastructure that supports both marketing effectiveness and environmental responsibility.

Gaps in Literature and Future Research Directions

The reviewed literature highlights several important gaps that limit current understanding of AI-driven sustainable advertising. First, methodological diversity is limited. Many studies are conceptual or based on single-case analyses, with few using longitudinal or multi-country datasets (Winarto & Wisesa, 2024). Future research should use mixed methods and longitudinal designs to assess how consumer trust and brand loyalty evolve in response to sustained AI-led sustainability strategies.

Secondly, most research is concentrated in specific sectors like cosmetics (Winarto & Wisesa, 2024) or consumer goods. There is minimal exploration of AI-led sustainable advertising in B2B sectors, public institutions, or energy-intensive industries like manufacturing or logistics, where

sustainability messaging is complex but equally essential. Thirdly, very few studies examine how emerging AI technologies such as generative AI (e.g., ChatGPT), digital twins, or blockchain-based advertising—intersect with sustainability communication. These technologies are already shaping digital engagement and content creation but have yet to be studied for their environmental or ethical impacts in advertising.

Another noticeable gap is regional imbalance. While some papers examine Southeast Asia (e.g., Winarto & Wisesa, 2024), most insights come from Western or global contexts. There is a lack of research on Africa, South America, or the Middle East, despite growing AI adoption and pressing sustainability challenges in these regions.

Addressing these gaps will not only improve academic robustness but also help companies design sustainable AI strategies that are regionally relevant, ethically grounded, and scalable.

CONCLUSION

This systematic review examined the intersection of Green AI, digital advertising, and corporate sustainability using 19 scholarly articles. The findings show that AI has the potential to optimize sustainable marketing by enabling personalization, efficiency, and data-driven insights. However, challenges such as greenwashing, energy consumption, and internal misalignment hinder its impact. The review identified five key themes: AI's transformative role in green marketing, strategic integration of sustainability, risks in AI-supported messaging, consumer engagement through personalization, and emerging theoretical frameworks. Theoretically, the study contributes by applying the Triple Bottom Line and Stakeholder Theory to interpret the complexities of AI-driven sustainability communication. Practically, it urges firms to embed sustainability not just in messaging but in operations, data ethics, and platform design. For policymakers, it highlights the need for stricter regulation of digital green claims and greater support for low-carbon AI infrastructure.

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