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Can Green AI Get-up-and-go Sustainable Transformation in the Fintech Division?

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Abstract

The rapid adoption of artificial intelligence (AI) by financial technology (FinTech) has led to significant efficiencies in products such as robo-advisors, credit scoring systems, and fraud detection systems. However, despite these beneficial developments, environmental concerns persist as the energy demand of AI models remains substantial. This study examines the environmental implications of AI-powered products, as well as the adoption of Green AI practices, including energy-efficient algorithms and sustainable infrastructure, by FinTech organizations. This study employed a qualitative, interpretive approach, utilising a total of twelve semi-structured interviews with participants in strategic, technical, and ESG roles. The thematic analysis revealed evidence that awareness of Green AI is increasing; however, there were inconsistent indications of actual implementation of the initiatives, as legacy systems hindered results, the lack of standard metrics, and limited stakeholder pressure. Almost certainly, if institutionalized and standardized, Green AI can provide FinTech with the opportunity to align its long-term sustainability ambitions. This study contributes to the ongoing discussion on responsible AI by connecting the conceptual threads of the study to the UN Sustainable Development Goals (SDGs 9, 12, and 13) and providing practical recommendations relevant to the FinTech industry.

Keywords: Green AI, FinTech, environmental sustainability, ESG, AI ethics, SDGs, Qualitative research, AI in financial services.

1 Introduction

The rapid proliferation of artificial intelligence (AI) is creating path-breaking change in the financial technology (FinTech) sector (Ahmed, 2024; Pham, 2018). AI-powered tools, such as robo-advisors, automated credit scoring, and algorithmic trading, have significantly enhanced the accessibility, efficacy, and personalization of several key FinTech products, enabling engaging and representative services to be provided to clients with minimal human involvement (Balboni, 2024; Nishant et al., 2020). AI augments specific activities to enable institutions to analyze vast amounts of data quickly, make real-time investment decisions, and provide personalized services to trade (Bahoo et al., 2024; Mesidis et al., 2023). However, the dramatic advances in service delivery models come with rising environmental impact ramifications (Schwartz et al., 2020). The

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operational activity of AI, particularly machine learning and data-intensive operations, requires the consumption of large-scale computational resources, necessitating significant energy consumption and raising significant sustainability concerns (Matheson, 2020; Organisation for Economic Co-operation and Development [OECD], 2022).

Organisations are AI-centric by default, as they shift their processes to enhance competitiveness and innovativeness (Olan et al., 2022). This raises the question of the sustainability of AI uptake in finance, especially since firms attempt to balance financial and environmental performance (Olan et al., 2022). AI integration necessitates a thorough examination of data quality, model privacy, and rigor, which raises the issue of responsibility regarding the use of such technologies (Jun, 2024). The role of interdisciplinary teams has been well-documented, ensuring that AI models (Pachot & Patissier, 2022) are developed in alignment with Environmental Science and Accounting, thereby facilitating the transition from creation to innovation in environmental impact assessment and reporting (Adelakun et al., 2024).

This concern has ultimately given rise to Green AI and has encouraged energy trade-offs for AI technologies that are effective. It strongly encourages a shift to energy-efficient algorithms, low-impact hardware, optimized model training, and sustainable data centers, to adopt a more environmentally responsible approach (Schwartz et al., 2020). It appears to us that Green AI is uniquely robust in theory; however, its adoption in practice within financial services is widely uneven (Yigitcanlar et al., 2021). Some FinTechs have aligned their operations to environmental, social and governance (ESG) principles, adopting sustainability dashboards, energy audits (Ahmad et al., 2025) and greener cloud strategies, for instance, and others simply prioritize speed, performance and profitability over sustainability because the incentives are unclear or there is limited understanding (Barker, 2025; Oyewole et al., 2024; Xu, 2024).

The purpose of this study is to investigate how technological developments in FinTech and AI affect environmental sustainability and the extent to which Green AI is being adopted in the industry (Bolón-Canedo et al., 2024; Verdecchia et al., 2023). More specifically, this study will investigate the environmental impact of services such as robo-advisors and automated credit systems, which have computational and infrastructural demands. Furthermore, it will assess how the adoption of Green AI activities, such as energy-efficient algorithms and environmentally sustainable data infrastructure, minimizes environmental impact (Bolón-Canedo et al., 2024). Lastly, we will discover the organizational, technological, and financial constraints FinTech organizations face when implementing the practices of Green AI (i.e. legacy systems, regulatory volatility, internal silo).

Another significant goal of the study is to investigate the impact of different ESG frameworks and stakeholder requirements on the logic and process of designing and deploying AI in financial services (Mahalakshmi et al., 2022). Investors, regulators, and advocates are starting to apply pressure for sustainability metrics that are transparent and on how ethical AI is used. However, in many cases, customers are either unaware of or uninterested in the environmental impacts resulting from the use of AI tools. This difference in pressure raises important questions about responsibility, accountability, and governance in the adoption of AI systems (Adelakun et al., 2024; Lakshminarayanachar et al., 2024).

To address these issues, the study employs a qualitative approach, based on a series of semi-structured interviews with stakeholders in the FinTech ecosystem. This includes a thematic analysis supported by NVivo, which extracts patterns and perspectives based on stakeholders' understanding of AI technologies that they had to implement (Hogg et al., 2023). The overall aim is to develop recommendations for FinTech companies that strike a balance between innovation and ecological responsibility. This research examined sustainability innovations to help firms comply with rapidly emerging environmental regulations through the adoption of sustainable

practices.

In summary, the primary research questions at the centre of this paper are: What is the environmental impact of AI-based services in the financial tech sector, specifically focused on robo-advisors and automated credit systems (Kaur et al., 2024), as one example of machine learning and/or AI in the current financial marketplace? How are Green AI practices used (if at all) in FinTech companies, and how does this shape ecological sustainability? How are Green AI technologies represented as being adopted or blocked in FinTech operations, along with their key enablers and barriers? How does the ethical and sustainable use of AI in financial services become entrenched as a moral responsibility in terms of ESG criteria (Huang et al., 2022) from organisations and community demands? Moreover, what reasonable recommendations can be made to FinTech firms, or what are the generally applicable considerations for balancing AI in a continuous, innovative, and pressing forward manner without harming the ecology?

This study contributes to a timely and significant conversation at the intersection of digital innovation and environmental sustainability. Emphasizing Green AI in FinTech allows us to bridge the world's latest digital innovation with the urgent need for environmental care. In this manner, it provides new opportunities for thought leadership in the FinTech ecosystem, as well as new pathways for scholars, researchers, and policymakers to foster a more responsible use of AI in the financial technology context.

2 Review of Literature

2.1 The Rise of AI in FinTech: Promise and Problems

The past decade has seen artificial intelligence (AI) redefine the FinTech horizon with faster, more innovative, and more accessible financial service avenues. From robo-advisors automating investment strategy to AI-based credit scoring models, financial players have worked on enhancing service efficiency and customer satisfaction via machine learning and big data (Giudici & Raffinetti, 2023). These innovations lowered transaction costs and enhanced risk analyses, as well as enhanced access to financial tools, which were previously available only to institutional clients (Mesidis et al., 2023).

The theoretical backing of Artificial Intelligence Control theory emphasis the effectiveness of incorporating AI technologies in work logistics to attain desired performance goals (Malhotra & Kharub, 2025). The theory presented strong criteria for utilizing Artificial Intelligence in work frameworks by incorporating four primary points to mitigate drawbacks faced by adopting AI into work frameworks (Huang et al., 2022; Wirtz & Müller, 2019). The main areas of focus the theory highlighted involved: 1) proper and accurate knowledge of AI designs and features that are incorporated, 2) operational knowledge integration and loop recognition, 3) human mechanism activities to implement and cooperate with the framework, and 4) computer-based capabilities for design implementation (Fan et al., 2020).

These potential points of Intelligence control theory highlighted the need for effective planning of technological design that needs to be incorporated to enhance work outcomes, along with resources and human capabilities (Elbashir et al., 2011) to successfully incorporate the framework in order to limit the loopholes and attain successful outcomes (Vrontis et al., 2023). The theoretical insights of this theory promote the execution of Green AI technologies through planned activities (Gao & Tang, 2023), aligning with human capabilities, resources, and the market's operational requirements. These features are significantly connected with promoting environmentally sustainable activities by adopting green AI practices, which contribute to and fulfill the requirements of the fintech industry (Dostatni et al., 2022).

Likewise, Artificial Control Theory is another theoretical approach that promotes the adoption of AI technological features to achieve work goals while also promoting a sustainable environment

(Yu et al., 2023). The Theory of Mind AI, with its theoretical insights, promotes the advancement of AI features that mimic human senses, including emotions, social interactions, beliefs, and intentions. This theory emphasizes the goal of AI technologies to promote environmental sustainability while incorporating advanced technological features into the work practices of various sectors, including finance. The human nature of robotics involved in work practices sensed their required roles in the social environment and work accordingly to promote sustainability through the application of Green AI technologies (Yigitcanlar & Cugurullo, 2020).

However, as researchers reap the benefits, they are now beginning to incorporate environmental concerns into their discussions. Training large AI models, processing financial transactions in real-time, and storing massive datasets in the cloud require high energy consumption, a significant portion of which comes from non-renewable energy sources (Schmidt, 2015). Schwartz et al. (2020), for example, have emphasised that the increasing trend in AI towards huge models is damaging to the environment. Thus, energy-efficient Green AI must become a new trend that does not compromise performance.

The implementation of artificial intelligence technologies in the financial or banking sector has yielded prominent success in both practical and theoretical implications. However, to make these powerful AI technologies yield impactful outcomes requires the necessary capabilities and resources (Milana & Ashta, 2021). The right combination of required resources, human and technological capabilities and control over the designs and outcomes increased the effectiveness of implementing AI technologies and their features in working environments.

AI-based services, such as JPMorgan Chase's COIN (Contract Intelligence) platform, automate document examination and conserve resources. (Morgan, 2024) HSBC scans for anti-money laundering (AML) risk and minimises manual checks with Google Cloud's analytics tools (May 2023). Robo-advisors such as Betterment (US), Nutmeg (UK), and StashAway (Singapore) are utilizing AI to manage investments for millions, with generally less environmental impact than traditional investment advisory services. (Bonelli, 2024) While efficient, these tools promote a greater need for computational energy and the adoption of more progressive, sustainable practices.

2.2 The Promise of Green AI: The Sustainability Meaning

Green AI can be thought of as a nascent concept that enables the design and implementation of AI systems with lower environmental footprints. There are low-energy algorithms, optimized training cycles, and investments in renewable energy, such as green data centers, to achieve these goals (Schwartz et al., 2020). Across the broader AI community, Green AI conversation is gaining momentum, particularly within certain research institutions and major tech companies. Many have published academic studies advocating lifecycle assessments for the carbon impacts of machine learning models (Bhuiyan, 2024; Romeiko et al., 2024).
The integration of sustainability into business operations arises due to a shift in prioritization from profit maximization to environmental stewardship and social fairness (Morgan et al., 2023). Organisations can practice sustainability and foster responsible innovation by mitigating the environmental impact of AI-powered tools through Green AI practices. Research on the application of artificial intelligence with decision support systems, optimisation models, and AI techniques has been noted to be lacking. (Nair et al., 2024) Regarding Green AI practices, the connection between AI-powered services and environmental footprints is indirect and moderated by the degree to which environmentally responsible methods are employed during the design and delivery of services (Hasan et al., 2024). Questions relating to the sustainability of technology are ever-growing, especially regarding the energy consumption and carbon output emissions associated with training large AI models (Pachot & Patissier, 2022).

This approach aligns with other studies that have focused on the AI's negative consequences, including energy consumption, resource consumption, and e-waste (Ligozat et al., 2022). The rapid

expansion of AI-powered tools in service provision raises concerns about environmental degradation, underscoring the importance of adopting Green AI practices in addressing this challenge. Many modern AI systems employed by various industries are documented to contribute excessively to environmental degradation.

Green AI was first promoted through research communities, such as the Allen Institute for AI, and has since spread to many countries. (Alzoubi & Mishra, 2024) Organisations such as ING and BBVA have begun to adopt green clouds, leveraging Microsoft's Azure sustainability calculator to manage energy usage from AI (BBVA, 2021). Legally, in Europe, the EU Artificial Intelligence Act (2024) promotes environmentally conscious design and energy-efficient algorithms for high-risk AI systems in its financial sector. The regulatory rationale is to promote a lower environmental footprint as AI advances (European Commission, 2025).

While further discussion is ongoing, the actual incorporation of Green AI tenets in FinTech has not been implemented in practice, nor has it been adequately studied. Although many global institutions, such as the OECD (2022) and the United Nations, acknowledge the sustainability risks associated with unchecked AI use, they tend to prioritise accuracy, speed, and a competitive edge over environmental concerns within financial services. Many do not calculate or disclose energy consumption from their AI tools (Adeyeri, 2024).

2.3 ESG, Fintech, and Sustainability Imperative

Concurrently, in the financial situation, increasing attention is being paid to Environmental, Social, and Governance (ESG) criteria. Increasingly, regulators and institutional investors are requiring firms to demonstrate responsible practices, including how technologies impact the environment (Barker, 2025). According to Adelakun et al. (2024), AI can enhance the reliability of ESG reporting, particularly using automated tools such as sustainability dashboards and carbon tracking algorithms. (Lim, 2024)

Worldwide, ESG-friendly AI solutions are seeing increased popularity. In Switzerland, UBS utilises AI-powered ESG rating engines to inform sustainable investment portfolios, while DBS Bank leverages predictive AI specifically for green financing, supporting solar and energy efficiency projects. (Green Finance Platform, 2018) These developments reflect the implementation of the EU's Sustainable Finance Disclosure Regulation (SFDR) and Singapore's Green Finance Industry Taskforce Guidelines, which subsequently require consideration of ESG integration that includes environmental metrics shaped by the use of AI. (Schumacher et al., 2022)

However, even as ESG frameworks encourage firms to adopt greater transparency and ethical conduct, one of the blind spots is the environmental impact of AI development and deployment. Most ESG assessments in the FinTech space consider social equity issues, bias in algorithms, and data privacy, rarely examining how AI systems impact carbon emissions and energy usage (Radanliev, 2025). There is a need for an expansion of the ethical framework in FinTech to include sustainability, as indicated by this gap.

2.4 What We Know About Barriers and Enablers

Some research has begun to identify the technical and organisational barriers to implementing Green AI. For example, Nishant et al. (2020) identify the disconnect between eco-conscious design practices and awareness among AI developers, while Nefla and Jellouli (2025) point to a lack of a regulatory framework and financial incentives as hindering the incentive for FinTech firms to invest in greener solutions.

On the other hand, there have been some signs of movement. Likewise, some early companies have begun to adopt energy-efficient models for cloud infrastructure and have implemented internal policies to guide their sustainable practices in AI as it evolves (OECD, 2022). However, these actions are typically sporadic, and there is no consensus across the sector on the metrics,

reporting standards, or best practices for Green AI. Finally, considering the limited demand from customers for lower-carbon digital finance products, a market-driven change remains limited.

Adoption on a global scale differs. For example, Denmark's Danske Bank and Germany's Commerzbank cite regulatory certainty and the capacity for sustainable green infrastructure as key enablers of sustainable digital innovation. In contrast, developing countries have limited data availability and very low literacy rates, which severely impact their capacity for adoption. Concerns about trust, accountability, and innovation highlight the need for ethically responsible actions when employing AI technologies that front the financial transparency burden (Patil, 2025). Nevertheless, the Green Finance Platform (2018) observes an increase in collaboration between FinTechs and climate NGOs in support of financing sustainability-focused AI research, indicating the potential for cross-sector partnerships to foster global impact (Ahmad et al., 2025).

2.5 Green AI in Fintech: A sustainable strategy or temporary trend

As society begins to recognise the environmental footprint of AI technologies, particularly in data-intensive sectors like financial services, debate is intensifying over whether the changes required for Green AI represent a long-term, future-oriented shift or if it will be viewed as a short-term compliance strategy. From an academic lens, the Triple Bottom Line approach, which addresses social, environmental, and financial implications (Correia, 2019) provides a valuable framework to explore the value proposition of Green AI. The premise is that Green AI can provide economic benefit (increased efficiency), social value (alignment with ESG elements), and environmental benefit (carbon reductions). Moreover, more generally, elements of the Technology-Organization-Environment (TOE) framework (Tornatzky & Fleischer, 1990) reported by Baker (2012) offer insight into how FinTech firms engaged with Green AI, by elucidating the internal, external, and technological factors that affect an organizations ability to adopt AI (Katebi & Tehrani, 2025). In terms of the TOE framework, firms that can align sustainability with reports of AI operational efficiency will position the organisation to plan practical benefits and leadership in innovation for a sustainable future.

Green AI is being implemented in the FinTech space worldwide, with varying levels of rigour. For example, the Spanish bank BBVA uses machine learning for more than customer engagement; they are optimising server loads and lowering energy consumption in their AI activities. Similarly, Mastercard is collaborating with Doconomy to develop an AI-enabled carbon calculator for its users, enabling them to track their environmental impact and help customers manage and reduce their own. In Sweden, SEB Bank is collaborating with tech firms to integrate energy-efficient AI into fraud detection, an area that typically requires substantial computing power. These examples demonstrate that Green AI is not only being implemented but also creating observable impacts, such as reduced electricity consumption, faster processing times, and fewer environmental externalities in the bank's operations.

Worldwide, regulatory agencies and multilateral organisations are also sending a signal of the importance of Green AI. The European Commission (2025) emphasised that elements of energy-efficient design and environmental sustainability are integral to the definition of high-risk AI systems. The World Economic Forum (2023) has emphasized the need for global coordination on sustainable AI development, with a focus on the financial sector, which operates on a scale with significant impacts. If AI is to become ubiquitous in digital finance, environmental efficiency is likely to become an obligation rather than a fringe concern.

The longevity of Green AI depends on both institutionalisation and standardisation. Without a standardised methodology that produces metrics upon completion of models to hold institutions accountable for carbon accounting, institutional "greenwashing" of AI initiatives will likely be prevalent. Moreover, organizations will need to rely on their measurements of environmental benefits from Green AI and weighting that against the exponentially higher computational

demands that generative AI and deep neural networks will inflict upon the fragile environment in the future in which they may computationally overpower the efficiency benefits of Clean AI (Ligozat et al., 2022; Schwartz et al., 2020).

This research addresses several of the United Nations Sustainable Development Goals (SDGs), with a direct focus on SDG 9: Industry, Innovation, and Infrastructure. Specifically, it provides insights into how financial institutions can develop and modernize their AI infrastructure to incorporate energy-efficient and resilient machine learning practices. This research also addresses SDG 13: Climate Action, as it provides pathways for reducing carbon emissions from AI systems used in the financial services sector. Lastly, the research indirectly contributes to SDG 12: Responsible Consumption and Production by promoting responsible innovation and the environmentally sustainable use of data. (United Nations, 2025)

This study demonstrates that Green AI is not simply a tactical initiative for complying with ESG metrics but rather a strategic shift that is unavoidable for the future of FinTech. By situating the conversation within theoretical frameworks and global applied examples, it highlights Green API as a unifier between performance and sustainability (Yigitcanlar & Cugurullo, 2020). It provides a practical way for firms to expand responsibly and contribute to regional and global climate change goals. In short, Green AI is not just a fad—if they have chosen to prioritise sustainability, firms must adopt Green AI as a strategic evolution within the digital finance ecosystem.

2.6 Theoretical Foundations and Systemic Gaps

Several theoretical frameworks establish a foundation for understanding the entwined nature of AI, sustainability, and organisational behaviour. One such example is the Artificial Intelligence Control Theory, which posits that an AI system can be successful only if it is established based on four key constructs: design knowledge, operational knowledge, human knowledge, and technological capacity (Fan et al., 2020). When aligned with Green AI, the Artificial Intelligence Control Theory suggests that sustainability constructs must be holistic, extending from the abstract (design) to the tangible (executive), to be effective.

Another, equally relevant model is the Theory of Mind AI proposed by van Wynsberghe (2021), which differs from the Artificial Intelligence Control Theory by incorporating human-like sensitivity into autonomous systems to facilitate ethical and social rationality. This theory highlights the potential for human similarity between AI technologies and human-like behaviour, with the most notable being human-like values such as concern for the environment. However, while these theoretical constructs demonstrate extensive opportunities for sustainability through AI technologies in multiple fields, few impacts have been operationalized in most, if not all, FinTech environments focused on sustainability, which emphasize performance-based metrics rather than environmental ethics.

This approach to systemic thinking is gaining global momentum. For example, the Bank of England has begun applying AI to its operational risk models for sustainability purposes. The Financial Conduct Authority (FCA) has launched a Green FinTech Challenge, expecting firms to develop AI solutions that incorporate sustainability-by-design principles. The World Economic Forum (2023) also advocates for a multi-level integration of Green AI principles throughout financial innovation ecosystems, to connect the ambition of global sustainability goals with action.

2.7 Recognised Gaps and the Rationale for the Study

In short, while significant advances have been made through our understanding of the technical capabilities of AI in FinTech, there remains a noticeable deficit in empirical evidence of the environmental footprint of AI, specifically, few studies have:

Examined how AI-powered services for FinTech such as robo-advisors and credit algorithms impact environmental sustainability in practice, Investigated the practical implementation of Green

AI characteristics by financial institutions, Examined the influence of stakeholder motivations and ESG pressures for sustainable development of AI, Presented qualitative perspectives from interviews where industry professionals discussed how they can identify and address opportunities and challenges associated with Green AI.

This study proposes to fill the gaps and to identify practical, interview-based implications and perspectives from stakeholders within the FinTech ecosystem. This study employs a thematic code and NVivo approach to examine not only what organisations are doing, but also how stakeholder organisations conceptualise their environmental responsibility when using AI. This research employs a combination of practical, theoretical, and ethical perspectives to provide a much-needed human-centered view of the challenges and enablers associated with the delivery of Green AI in FinTech.

3 Materials and Methods

3.1 Research Design and Philosophical Orientation

This research utilizes a qualitative research design to analyse the environmental consequences of AI adoption in the FinTech sector, with particular reference to how organizations "understand," "embed," and "practice" Green AI, as influenced by the intra-organizational and stakeholder interplay between "conceptual" and "particular" contextual factors (Palinkas et al., 2015). Choosing a qualitative approach was influenced by my perspective on the complex, contextual, and embedded nature of the research questions, particularly the need to gain meaningful insights into subjective views, organizational actions, and ethical issues related to the use of AI in financial services (Creswell & Poth, 2018).

In keeping with this design, the research adopts an interpretivist research philosophy, which focuses on understanding how individuals create meanings related to a phenomenon in their specific contexts. For example, interpretivism is particularly applicable here, as it allows the researcher to explore how FinTech practitioners (Ligozat et al., 2022) construct their contextual meanings surrounding the impact of technology (e.g., trade-offs between technological innovation, while ensuring environmental sustainability). Interpretivism contrasts with positivist paradigms that pursue objective, universal truths, as it embraces the socially constructed nature of knowledge, which is especially valuable as there are many emerging and value-laden issues related to climate change, Green AI and ESG compliance (Pham, 2018).

3.2 Data Collection Method

To collect primary data, we conducted semi-structured interviews with 12 experts working in various roles in the FinTech and sustainability ecosystem. Interviews were conducted via telephone and Google Meet between February and April 2025, based on the participants' availability and geographic restrictions (Morgan, 2024). The semi-structured interview format provided the opportunity to explore participant insights while maintaining consistency on the core research questions.

An interview guide was created based on the literature review of AI technologies, Green AI practices, and sustainability challenges in financial services (Nishant et al., 2020; van Wynsberghe, 2021). The interview guide contained open-ended questions on organizational readiness for Green AI, current sustainability practices, described barriers, ESG impacts, and recommendations for improvement. The questions were piloted and refined prior to the rollout of the complete interview to ensure clarity and alignment with the study objectives.

3.3 Sampling strategy and Participant profile

This research employed purposive sampling to recruit individuals with firsthand experience in AI deployment and sustainability practices within the FinTech domain. Key criteria for participant

selection were the insights on the research questions and the level of their position and experience if the participant held a role that influences, designs, or manages AI-enabled or sustainability-related systems or strategies. The purposive strategy resulted in a critical mass of insightful and relevant information. Snowball sampling was also employed in some instances to recruit qualified participants, as the initial participants identified other suitable individuals in their network who met the study's criteria (Ahmed, 2024). The snowball sampling strategy was particularly useful in facilitating access to a broader range of informed stakeholders, especially when seeking individuals in specific roles where there were limited sources of experts.
The research interviewed 12 people with unique positions within the FinTech ecosystem, including: Chief Technology Officer (CTO), Sustainability Officer, AI Engineer, Compliance Manager, Data Scientist, Financial Analyst, Green Tech Consultant, Operations Manager, IT Infrastructure Manager, Risk Manager, Product Development Manager, and ESG Strategy Advisor. This cross-functional group provided a comprehensive range of insights, encompassing technical development, compliance and regulatory considerations, product development, risk management, and environmental strategies (Balboni, 2024).

By incorporating their diverse perspectives, the group was able to develop a more comprehensive understanding of the challenges, motivations, and perceptions associated with the adoption of Green AI practices and including perspectives from both strategic and operational representatives ensured that the findings captured the authentic complexities of working and the dynamics of an organisation in the fast-evolving FinTech industry.

3.4 Ethical Considerations

The study maintained its ethical integrity by adhering to academic guidelines throughout the research process. All participants were informed about the purpose of the study and their right to confidentiality. Informed verbal and/or written consent was obtained prior to each interview. Participants were assured that their responses would be anonymised and utilised only for academic purposes. The audio recordings and transcripts from the interviews were securely stored and will be deleted six months after the project's conclusion, by institutional data retention policies.

3.5 Data Analysis Strategy

The interview data collected were transcribed and analyzed thematically using NVivo software, a sophisticated software program for storing, managing, and coding qualitative data. Thematic analysis is an analytical approach that enables researchers to identify, analyze, and report significant patterns—"themes"—within the data, which is considered an established qualitative research method (Braun & Clarke, 2006). The researcher initially coded the data manually to familiarize herself with it. The manual codes were then grouped under broad themes that matched the research questions.

The data analysis was conducted using Braun and Clarke's six-phase process: familiarizing oneself with the data, generating initial codes, searching for themes, reviewing the themes, identifying and naming themes, and producing the final report. The themes were not pre-distinguished a priori but were created inductively from the data, as it related to the lived experience of the participants in their professional roles. The convergence and divergence from differing organizational roles in the sample were emphasized and clearly articulated in the interpretation.

3.6 Validity and Trustworthiness

Triangulation of data sources was achieved by utilizing different perspectives provided by various job roles and organizational contexts, which enhanced the credibility of the findings. Member checking was also conducted by sending spin-off versions to selected participants to validate the interpretations of the data and refine the boundaries of the code and themes. Additionally, an audit trail of the analysis process was maintained to demonstrate the transparency and dependability of

the research procedures (McLeod, 2024).

4 Results

This section presents the qualitative data from 12 semi-structured interviews with FinTech professionals, where the data were analyzed using thematic coding in NVivo. Thematic analysis identified eight themes that illustrate how Green AI is perceived and utilized within the financial services sector. Participant experiences across organisational functions support each theme.

4.1 Data Visualisation

Word cloud

Figure 1: Word Cloud

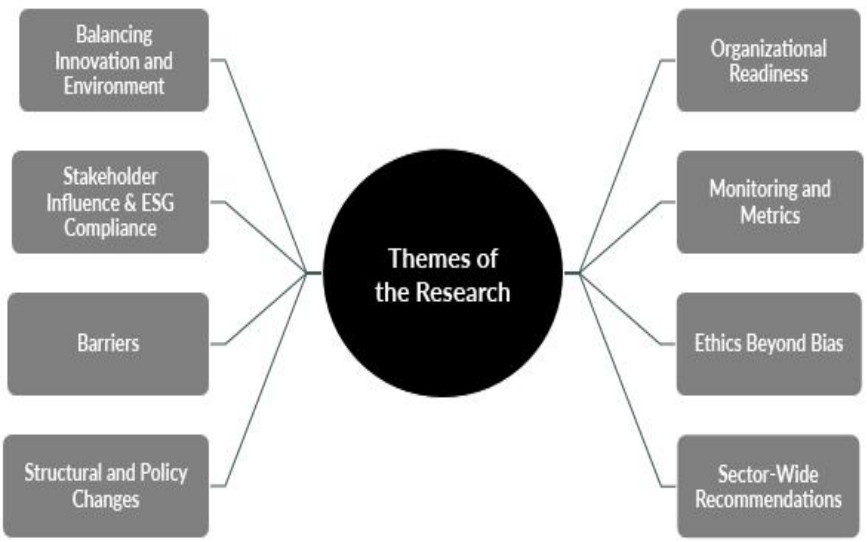

Figure 2: Conceptual Framework

4.2 Theme 1: Creating a Balance Between Innovation and the Environment

A theme that was common among participants was the juxtaposition of technology innovation and sustainability. While many participants recognised the growing awareness surrounding the carbon footprint of AI systems, several participants stressed that in most FinTech contexts, performance and speed are still the dominant priorities. As one Chief Technology Officer explained, "Green AI sounds great, but unless it is better than the current system in both accuracy and cost, it will not be adopted on a large scale." This finding resonates with the concerns expressed in the literature that sustainability objectives are often deprioritised unless they align with profitability and efficiency (OECD, 2022; Schwartz et al., 2020).

4.3 Theme 2: Organisational Readiness

Participants reported different levels of preparedness within their organizations for implementing sustainable AI solutions. A handful of organizations were using sustainability dashboards or some form of carbon measurement tools. However, for many organisations, they were still in the initial exploration phase due to a lack of interdepartmental collaboration and limited awareness from engineering and tech teams. One ESG Strategy Advisor said, “Most of the engineers I talk to do not even know what Green AI is, so we are still educating within one organisation.” This supports previous research that identified organizational siloing and knowledge barriers as barriers for Green AI adoption (Nishant et al., 2020).

4.4 Theme 3: Stakeholder Pressure and ESG Compliance

Many participants identified investors and regulatory bodies as key external factors driving ESG compliance. However, most participants agreed that customers are not yet applying pressure for environmental accountability about how AI will impact ESG goals (Ligozat et al., 2022). This results in an uneven distribution of pressure, primarily at the higher levels (i.e., boardrooms and executives), rather than at the lower levels (i.e., product, developers, and engineers). These findings support Barker's (2025) assertion that investors primarily drive ESG movement and that customer-level pressure for ESG compliance and accountability is emerging.

4.5 Theme 4: Monitoring and Metrics

Many participants noted that there are no standardised tools for benchmarking to capture AI’s environmental footprint. A few companies had begun tracking their GPUs, using internal carbon calculators, or evaluating external plug-ins. However, due to the lack of company-agnostic protocols in the sector, there is no consistency or benchmarking available. One Data Scientist said, “We monitor our model training time, not the energy use. That is next, if there is a way.” This reinforces the OECD (2022) call for transparent and uniform reporting for environmental considerations in AI.

4.6 Theme 5: Barriers

The participants identified four primary barriers to implementing Green AI: legacy infrastructure, performance trade-offs, regulatory uncertainty, and gaps in incentives. One Risk Manager said, “We cannot make the switch unless it has clear ROI or some sort of a mandate.” This echoes the issues identified by Nefla and Jellouli (2025), arguing that without incentives of a financial or regulatory nature, sustainability is often viewed as an afterthought.

4.7 Theme 6: Ethics Beyond Bias

The participants reported a shift in their ethical framing. They were of the view that AI ethics should address aspects beyond simply mitigating bias. An example of this shift was seen when a Compliance Manager mentioned that education stakeholders (Yigitcanlar & Cugurullo, 2020) have built governance protocols around fairness and privacy, but not on addressing environmental harm. They indicated that this was a "blind spot." This resonates with the calls from researchers

noted in this section, including Jun (2024), for an expanded view of AI ethics that "bridges the gap between sustainability challenges and the potential for sustainable AI".

4.8 Theme 7: Structural and Policy Change

Insufficient protection to address the sector-level AI carbon footprint was primarily seen as a blocked pipeline issue. Participants indicated a wearisome desire for "explicit policy, ESG-aligned AI policy, and support for collaboration and inter-sector accountability". To date, only limited forms of internal policies have been enacted, and while they were required, inclusionary policies could prove suitable. These findings reinforce the literature's call for structural change along with the harmonisation of policies (Barker, 2025; Pachot & Patissier, 2022).

4.9 Theme 8: Sector-Wide Recommendations

Participants suggested ways to integrate Green AI into FinTech, such as energy audits, green KPIs, energy-efficient cloud services, and cross-departmental sustainability training. Critically, however, Green AI was considered not merely a technical uplift but a shift in terms of strategy and culture. This aligns with Schwartz et al. (2020) and Adelakun et al. (2024), who argue that Green AI must be an integral part of an organisation's DNA for it to matter in the long term.

5 Discussion

This study revealed an important but underexplored area within the FinTech sector: the environmental impact of artificial intelligence. While AI has made the financial services sector better through automation, personalisation, and insights from complex data sets, evolution can come at a 'viewed' ecological cost. Participants in this study acknowledged that, although AI offers new possibilities for financial services, a tension exists between innovation and sustainability that needs to be considered. Participants indicated that, although awareness of Green AI is building, practical adoption is piecemeal and typically comes second to performance and profitability. This validates Schwartz et al.'s (2020) authorship, noting that if "energy efficiency is not brought into the metrics of success, Green AI will always be on the back burner."

According to this study, stakeholder pressure—more than any other factor—is perhaps the most critical leverage point for environmental accountability in AI. Stakeholder pressure from investors and regulators has a direct influence on firms (Fan et al., 2020). Many firms have acknowledged that ESG frameworks are still evolving, yet they are driving executive decision-making more than ever before. Most of these pressures are top-down, as customer pressure and demand for environmentally responsible AI products are very limited (Hasan et al., 2024). This seems consistent with Barker's (2025) perspective that investors lead the adoption of ESG frameworks in FinTech and that they are not yet deeply operationalized across the organization. At the same time, sustainability officers and ESG strategists themselves are pushing for the development of greener AI models (Dostatni et al., 2022). However, technical teams often lack appropriate training, rewards, or mandates to create such models. This also aligns with Nishant et al. (2020), who state that sustainability commitments are woefully difficult to translate into technical delivery, unless organisations have a specific function within their organisation.

An important gap identified through interviews was the absence of standard tools and benchmarks to track the carbon footprint of AI systems. While some participants initially explored energy tracking or carbon calculator tools, there is no standard approach within industry for measuring or defining environmental impacts. The lack of standardisation limits transparency and accountability, as also observed by the OECD (2022). Without a standard metric, it is challenging for organisations to weigh the trade-offs between model performance and environmental impact, let alone credibly share those results with stakeholders.

The research also highlights considerable organisational and technical barriers to the adoption of

Green AI practices, as outlined below. Veterans of the current score highlighted degraded and unsupported infrastructure that is not conducive to energy efficiency, as well as the absence of cross-functional collaboration between sustainability teams and technical teams. Additionally, the lack of regulatory mandates or financial incentives to spur investment in ecologically efficient systems was noted. These findings are consistent with Yadav and Singh's (2023) study, which identified similar barriers to digital industries that are known to incorporate sustainability into their AI pipelines. Interestingly, several organisations have begun early pilots implementing internal policies and cross-departmental initiatives, which could indicate that early adoption may become models or learning labs for the sector.

One particularly insightful result of this research was the recognition that AI ethics needs to be broadened beyond issues of fairness, privacy, and bias to include environmental sustainability. Several participants noted how their organisations had excellent structures for algorithmic fairness and explainability, yet practically none relating to the environmental footprint of their technologies. This affirms Jun's (2024) critique that current AI governance frameworks are too myopic and need to evolve to incorporate environmental considerations as part of responsible innovation. In this sense, Green AI is not only a technical improvement but an ethical necessity- a way to reconceptualise how we define responsible digital transformation.

Ultimately, participants confirmed that implementing Green AI is more than just a matter of technical adjustments; it entails a change in both culture and strategy. Some examples include instituting green key performance indicators (KPIs), fostering energy-efficient cloud services, and creating sustainability training for engineers. Implementing Green AI into the core values and operational models of FinTech firms is essential for the future of Green AI. This advice aligns with previous work by Adelakun et al. (2024), who propose that sustainability must be integrated into both design thinking and the product life cycle. The interviews in this study not only provide an endorsement for these observations, but they also provide granular, practice-based insights into how firms are starting or struggling to operationalise this approach.

6 Conclusion and Recommendations

6.1 Conclusion

In this study, we examined the emerging confluence of artificial intelligence (AI) and environmental sustainability in FinTech, with a focus on the concept and practice of Green AI. Through twelve expert interviews and using a qualitative, interpretivist methodology, we aimed to understand the environmental perceptions of AI systems among FinTech professionals, what they consider to be or constitute sustainable AI, and whether altering barriers and enablers influences their decision-making.

Our findings suggest that there is some awareness of the environmental impacts of AI-based services, such as robo-advisors and automated account opening and credit systems. However, the realisation of Green AI principles in practice was both inconsistent and underdeveloped (Barker, 2025). Organisational priority remains on performance, scale, and return on investment, with sustainability often being a secondary concern, unless influenced by external factors such as investor obligations or regulations.

A significant deficit exists, as there are no standardised metrics for measuring the carbon footprint of AI, which hinders accountability and comparison across the ecosystem. Moreover, the lack of cross-silo collaboration, beset by legacy infrastructure, and low levels of awareness among technical teams are all substantial internal barriers (Pachot & Patissier, 2022). Another significant consideration is the emphasis participants place on the importance of ethical AI governance frameworks evolving to include environmental considerations, not just bias and privacy, as part of their remit.

Notably, this research makes a unique contribution by providing firsthand stakeholder perspectives from not only technical, but also strategic and regulatory perspectives. It illustrates the complexity of integrating Green AI into the dialogue; it is not a straightforward technology upgrade, but a reorganization and cultural shift that requires a whole-of-organization buy-in. As the FinTech ecosystem continues to grow, there will be significant pressure to incorporate environmental sustainability into AI development and roll-out for the future resilience of organizations, regulatory compliance, and corporate responsibility.

6.2 Recommendations

Using the findings from this study, we present a series of practical recommendations for FinTech firms, policymakers, and technology leaders who all seek to promote the sustainable integration of AI. First, FinTech firms should consider integrating environmental indicators into the lifecycle of AI. It is essential to incorporate KPIs, such as energy consumption, emissions, and data centre efficiency, into the AI model development and deployment phases. This would enable firms to benchmark their performance, identify inefficiencies, and better align their operations with the broader ESG agenda.

Second, these sustainability teams would be essential in the following functions. As specific Green AI task forces comprising sustainability officers, data scientists, engineers, and product managers, these teams would collaborate to design environmental objectives, manage usage data, and align with ESG-specific considerations both internally and externally. Their teams would also foster an innovative culture for Green AI in firms.

Third, there is a crucial need for industry-wide standards and certifications. Regulators and professional bodies should work towards developing standard frameworks and third-party verification systems, such as "Green AI Certified." This will enhance transparency and promote healthy competition and consistent practices throughout the FinTech industry.

Apart from developing the above-mentioned structures, we also need enthusiasm for policy incentives. Governments and financial regulators, such as the CIEDD in Canada, could provide tax deductions, subsidies, or grant programs for firms that demonstrate environmentally responsible AI operations. Such policies could mitigate the cost of upgrading infrastructure and spur innovation in sustainable AI technologies.

Furthermore, the current definition of AI ethics should be expanded to encompass environmental sustainability. Risk managers, compliance officers, and ethics boards should make it a standard practice to consider sustainability issues alongside bias, privacy, and transparency, and integrate those ramifications into their governance frameworks. It will ensure that environmental priorities are aligned with traditional AI risks and more closely aligned with global sustainability goals and stakeholder expectations.

Upskilling is another critical level. FinTech companies must equip their technical staff with the necessary equipment and skills to develop, test, and implement Green AI solutions. This could include conducting in-house training programs, encouraging cross-functional teams, or incorporating sustainability modules into AI development courses.

Lastly, companies need to engage stakeholders through open and verifiable disclosure. Incorporating environmental data related to AI in ESG reporting can enhance investor trust, spur internal accountability, and foster an organisational culture of sustainability. Public disclosure also aids reputational value and serves to signal long-term strategic alignment with international sustainability commitments.

Taken together, these suggestions provide a realistic blueprint for FinTech firms to navigate innovation while being environmentally responsible. These are not exhaustive suggestions, but

rather primary steps toward making Green AI an integral aspect of sustainable digital transformation. To make this vision a Reality, however, will necessitate concerted action at the level of industry, government, and civil society in terms of institutionalising and scaling up sustainable AI practices.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request. All relevant data generated or analyzed during this study have been included in the article.

Conflict of Interest Statement

The authors declare that there is no conflict of interest regarding the publication of this paper.

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