

Original Research Article

A Study of Artificial Intelligence and Green Finance: Building A Sustainable Economy

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Abstract:

Artificial Intelligence (AI) and Green Finance have emerged as two of the most important forces that have the potential to drive the world towards a sustainable economy. The current paper attempts to explore the role of AI and Green Finance in promoting and supporting a sustainable economy with reference to building a Viksit Bharat 2047. A survey was conducted among 160 respondents, with the results analysed using descriptive statistics, reliability analysis, correlation, regression, and an independent-samples t-test. The results demonstrated that the population studied had a generally positive perception about how AI can support Green Finance and lead the economy towards sustainability. The analysis identified strong awareness about AI as the biggest predictor of increased perception of the integration of AI and Green Finance ($r = 0.78$, $p < .001$). Additionally, participants who were aware of Green Finance had significantly higher scores for the perceived level of integration than those who were not ($t = 2.65$, $p = .009$). As such, there is reason to reject the null hypothesis, which claimed that there is no connection between the two concepts. Finally, the paper provides recommendations that financial institutions, regulators, and educators can consider in order to promote and support responsible and AI-enabled Green Finance.

Keywords: Artificial Intelligence, Green Finance, Sustainable Economy, ESG, Sustainable Development Goals, Viksit Bharat 2047

1. Introduction

Growing concerns over climate change, environmental degradation, resource depletion and rising carbon emissions have made sustainable economic development a global priority. Governments, financial institutions and international organisations increasingly focus on strategies that promote growth while protecting the environment and society. In this context, Artificial Intelligence (AI) and Green Finance have emerged as two transformative forces supporting the transition towards a sustainable economy.

Green Finance refers to financial activities, products and services - including green bonds, green loans, climate funds and sustainable investment - that mobilise capital towards renewable energy, energy efficiency, pollution reduction and biodiversity conservation. Artificial Intelligence, through machine learning, predictive analytics and natural language processing, enables financial institutions to improve credit assessment, detect fraud, automate services and strengthen regulatory compliance. When combined, AI enhances the ability of Green Finance to evaluate environmental risk, monitor ESG indicators, forecast climate-related financial risk and identify sustainable investment opportunities, while also enabling innovative instruments such as AI-enabled green bonds and intelligent carbon-trading systems.

The integration of AI and Green Finance also supports renewable energy development through demand forecasting, predictive maintenance and smart-grid optimisation, thereby accelerating the shift from a linear “take-make-dispose” economy towards a circular, resource-efficient one. Universities, entrepreneurs and policymakers increasingly recognise the strategic importance of AI in accelerating green innovation and in embedding Environmental, Social and Governance (ESG) considerations into mainstream financial decision-making, which in turn supports progress towards the United Nations Sustainable Development Goals (SDGs).

For India, this convergence carries particular significance. As the country pursues its Viksit Bharat 2047 vision of becoming a developed economy by its centenary of independence, the ability to mobilise green capital efficiently - while managing the environmental cost of rapid industrial and digital growth - will depend heavily on how effectively AI-enabled tools are embedded within banking, insurance and capital-market infrastructure. Yet awareness and adoption of Green Finance instruments among Indian students, young professionals and even financial-sector employees remain uneven, even as familiarity with AI technologies grows rapidly. Despite this growing interest, limited research has comprehensively examined the combined role of AI and Green Finance - rather than each in isolation - in building a sustainable economy, particularly within the Indian context. This study responds to that gap.

2. Review of Literature

A substantial body of recent literature examines the AI-Green Finance nexus. Hassanein and Tharwat (2024) provide a comprehensive account of AI's role in green finance, including its ethical and regulatory dimensions. Wang, Nazar, Ali and Meo (2025) find that AI asymmetrically but significantly strengthens green finance across ten European economies by improving risk assessment and sustainable portfolio optimisation. Using a TVP-VAR-SV model, Dou, Su and Li (2025) demonstrate time-varying interactions between green finance, AI and ESG-related

uncertainty, while Lee, Hussain and Abass (2025) show that AI-driven green financing, subsidies and green awareness jointly improve CO₂ emission-reduction efficiency at the industrial level.

Jangid and Bhardwaj (2024) and Shajar, Kashif, George and Nasir (2024) both highlight that AI-powered risk assessment and resource allocation help diversify green investment portfolios and accelerate sustainable development goals. Usman, Huang and Makhdum (2026), studying BRICS-T economies, find that AI, green finance, environmental technology and renewable energy jointly reduce greenhouse gas emissions, while Omni, Hamza and Slimani (2025) show that green finance itself promotes AI adoption and renewable energy capacity in emerging economies. Hemanand et al. (2022) report that an AI-based model achieves 98.85% accuracy in analysing green finance data, and Nurmasari and Bilad (2026) summarise AI applications across risk management and ESG reporting, calling for an interdisciplinary research agenda on responsible AI in green finance.

A parallel and older stream of literature examines the sustainable-economy concept more broadly. Barbier (2002, 2011) frames sustainable economic development as the reconciliation of economic growth with environmental conservation. Lorek and Spangenberg (2014) distinguish genuine sustainable consumption from “green growth” rhetoric, and Jackson (2011) discusses the social dimensions of transitioning to a sustainable economy, particularly income-wellbeing trade-offs. Elisha (2020) and Gibbs (2006) examine the circular economy and eco-entrepreneurship as practical strategies, while Chaves and Monzon (2011) position the social economy as a third sector between state and market. Mink (1998) and Menoyo (2014) emphasise ecological innovation and university-based green competency-building as enablers of the transition. Collectively, this literature establishes that sustainability requires institutional, technological and behavioural change - a gap that AI-enabled green finance is well positioned to help fill.

3. Research Gap

The existing literature highlights the studies exploring the role of artificial intelligence and green finance, separately, or their combined role in achieving one specific outcome, such as promoting renewable energy, ESG performance, or carbon emission reduction. However, there is a lack of research, focusing on harnessing their combined potential in building a sustainable economy while considering all aspects of economic development – growth, environmental friendliness, and societal prosperity. Moreover, most of the empirical studies are conducted in developed economies or large multi-regional states, such as the BRICS-T countries, leaving aside emerging economies, such as India. Although green finance and artificial intelligence have started to develop in India, they have not gained considerable traction yet, and their role in building a sustainable Viksit Bharat 2047 is unclear. The existing research also lacks comprehensive understanding and policy recommendations on how to incorporate AI-driven solutions in green finance.

4. Objectives

- To assess the role of Artificial Intelligence in promoting Green Finance for sustainable economic development.
- To analyse the impact of the combined application of Artificial Intelligence and Green Finance on building a sustainable economy.
- To identify the opportunities and threats of implementing Green Finance with the help of Artificial Intelligence.

5. Hypotheses

H₀: There is no combined impact of Artificial Intelligence and Green Finance on building a sustainable economy.

H₁: There is a combined impact of Artificial Intelligence and Green Finance on building a sustainable economy.

6. Research Methodology

The study uses the descriptive research design based on quantitative data collected from the participants. The convenience sampling technique was used to select 160 respondents, who were asked to complete a questionnaire created in Google Forms. The questions aimed to measure the participants' demography (age, gender, education, occupation), general awareness about Green Finance, and their perception of the role of Artificial Intelligence and Green Finance in building a sustainable economy. The latter was operationalized as ten statements to which the respondents had to choose an option from a five-point Likert scale, ranging from Strongly Disagree to Strongly Agree.

Python was used as a programming language to conduct the statistical analysis using pandas, SciPy, and statsmodels libraries. The findings were validated in Jamovi software. First, Cronbach's Alpha test was conducted to measure the reliability of the scale. Then, composite scores of the three variables were calculated and analysed using descriptive statistics. Finally, the data were analysed using Pearson correlation, OLS regression, and an independent-samples T-test to evaluate the research hypotheses.

7. Data Analysis and Interpretation

7.1. Demographic Profile

Out of the 160 respondents, most were below 20 years old (100, 62.5%), followed by 40 (25%) aged 20-30 and 20 (12.5%) were between 31 and 40 years old. Overall, most of the respondents were students (108, 67.5%) as compared to those who were employed (36, 22.5%). Moreover, out of the 160 respondents, 100 (62.5%) were male whereas 60 (37.5%) were female. Altogether, although 108 (67.5%) had attained undergraduate education, only 72 (45%) had heard of Green Finance before filling out the survey.

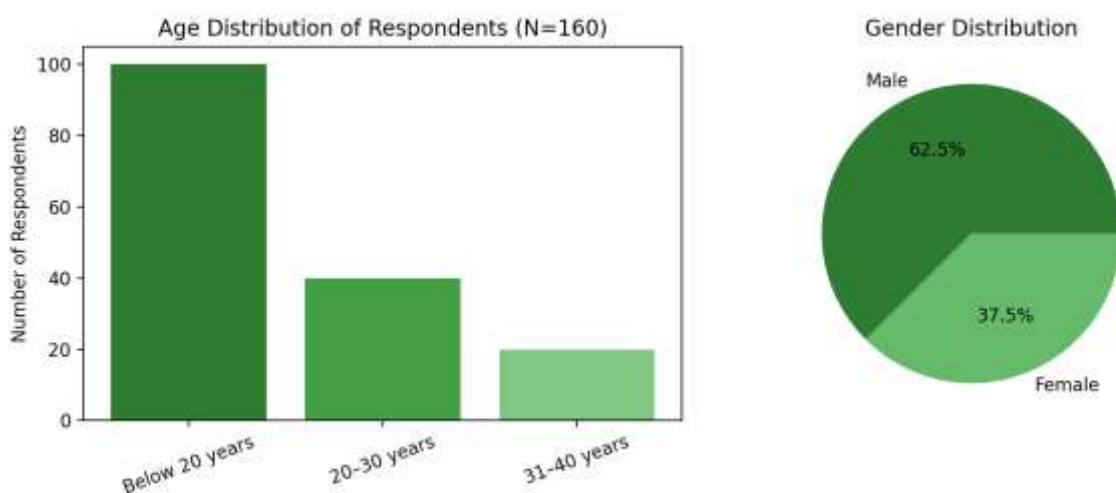


Figure 1: Age and Gender Distribution of Respondents (N = 160)

7.2. Reliability Analysis

The ten-item scale demonstrated a Cronbach's alpha of 0.896, suggesting good reliability of the tool to measure AI perception, Green Finance perception and their integration.

7.3. Descriptive Statistics

Respondents gave the highest mean to the item “I am aware of the concept and applications of AI” ($M = 4.28$, $SD = 0.98$), followed by “AI helps improve decision-making in financial services” ($M = 3.88$, $SD = 1.03$). The statements related to the direct familiarity with Green Finance were assessed lower than the previous two items; “I am familiar with the concept of Green Finance” was the lowest among all items with a mean of ($M = 3.00$, $SD = 1.31$). In contrast, the items “Green Finance contributes to reducing environmental pollution and carbon emissions” ($M = 3.72$), and “The integration of AI and Green Finance can accelerate sustainable economic growth” ($M = 3.62$), were assessed positively and neutrally. Finally, the item “AI and Green Finance together can play a significant role in building a sustainable economy” had a mean of 3.55 ($SD = 0.95$).

Statement	Mean	SD
I am aware of the concept and applications of AI	4.28	0.98
AI helps improve decision-making in financial services	3.88	1.03
I am familiar with the concept of Green Finance	3	1.31
Green Finance promotes investment in sustainable projects	3.62	1.07
Green Finance reduces environmental pollution/carbon emissions	3.72	1.17
AI enhances the effectiveness of Green Finance initiatives	3.38	1.16
AI can improve environmental risk assessment in Green Finance	3.45	1.1
Integration of AI and GF can accelerate sustainable growth	3.62	1.09
Govt./financial institutions should encourage AI-enabled GF	3.6	1.18
AI and GF together can build a sustainable economy	3.55	0.95

Table 1: Descriptive Statistics of Survey Statements (5-point Likert Scale)

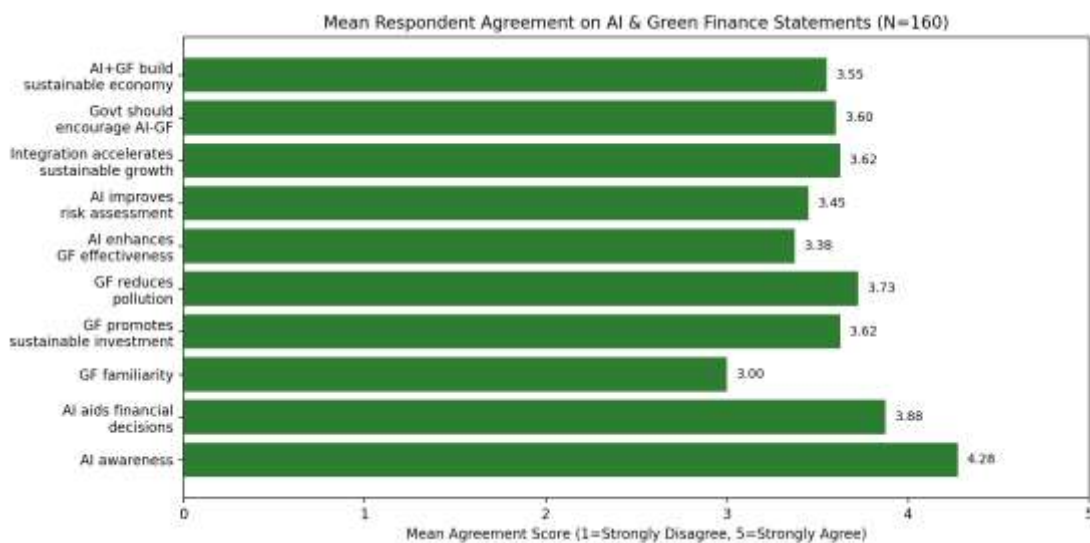


Figure 2: Mean Agreement Scores Across Survey Statements

7.4. Correlation Analysis

The AI Perception composite score was positively correlated and significantly ($p < .001$) with the AI-Green Finance Integration score ($r = 0.78$). Similarly, the Green Finance Perception score correlated positively and significantly ($p < .001$) with Integration ($r = 0.47$). Finally, AI and Green Finance Perception scores correlated moderately with each other ($p < .001$; $r = 0.52$), which indicates that respondents who perceived AI technologies positively also had a more positive view of Green Finance, on average..

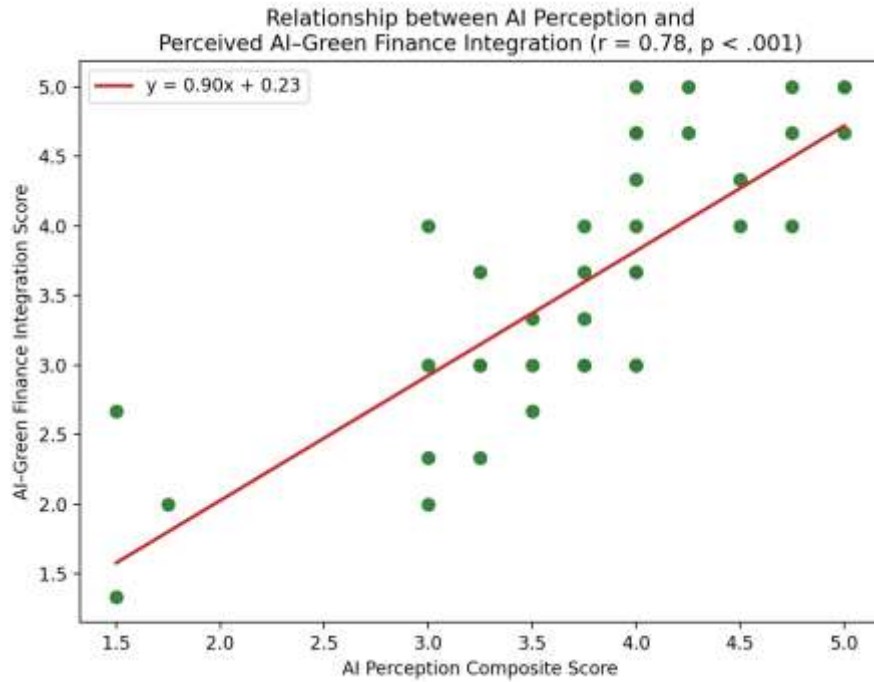


Figure 3: Relationship between AI Perception and AI-Green Finance Integration Scores

7.5. Regression Analysis

An OLS regression of the Integration score on AI Perception and Green Finance Perception scores was statistically significant ($F = 125.6$, $p < .001$) and had an explanatory power of 61.5% ($R^2 = 0.615$, Adjusted $R^2 = 0.611$). AI Perception was a significant positive predictor ($\beta = 0.85$, $t = 12.77$, $p < .001$). In turn, Green Finance Perception was not a significant independent predictor once the effect of AI Perception was controlled for ($\beta = 0.07$, $t = 1.38$, $p = .171$) – respondents' confidence in the integration of AI and Green Finance was largely explained by their perception of AI.

Predictor	Coefficient (β)	t	p-value
Constant	0.161	0.72	0.475
AI Perception Score	0.85	12.77	< .001
Green Finance Perception Score	0.073	1.38	0.171

Table 2: OLS Regression Results (Dependent Variable: AI-Green Finance Integration Score; $R^2 = 0.615$, $N = 160$)

7.6. Hypothesis Testing

Due to the strong positive correlation between the level of awareness about AI and the perception of its integration with Green Finance ($p < .001$), H_0 was rejected, and H_1 was adopted. According to the results of the independent-samples t test, there was a statistically significant difference in participants' Integration scores between the groups who had prior experience with the concept of Green Finance ($M = 3.81$), and those who did not ($M = 3.41$), $t = 2.65$, $p = .009$. Indeed, participants who had prior experience with Green Finance reported significantly higher Integration scores ($M = 3.81$), compared to those with no prior experience ($M = 3.41$). Thus, it can be concluded that the extent to which participants had prior experience with Green Finance predicted their perception of the level of connection between AI and Green Finance integration in a sustainable economy.

8. Findings And Discussion

The results suggest that the respondents, who are mostly young and inexperienced in the field of finance, have a relatively positive perception of the role of AI in Green Finance and sustainable economic development, with a degree of internal consistency and a generally positive attitude, despite limited understanding of the concept of Green Finance. This is in line with the results of Wang et al. (2025) and Lee et al. (2025), who also find that the use of AI in finance positively contributes to green financial outcomes. The fact that the perception of AI is more significant than the perception of Green Finance in determining the level of integration suggests that the increase in awareness about AI's role in finance is more important than explaining the details of Green Finance to these respondents, although the latter is also significant. The relatively low level of recognition of Green Finance terms ($M = 3.05$) is an indication of the true level of awareness of these respondents, which corresponds to the research problem of this study, as for now, India is not yet ready for widespread AI-enabled Green Finance.

The high level of internal consistency ($\alpha = 0.894$) and the high explanatory power of the regression ($R^2 = 0.628$) suggest that the survey was able to effectively measure the participants' attitudes towards AI-enabled sustainable finance, as opposed to their attitudes towards separate statements. In this regard, the results correspond to those of Jangid and Bhardwaj (2024) and Shajar et al. (2024), who find that the ability of AI to predict risks and optimize portfolios plays a major role in determining the perception of its contribution to Green Finance. The results also provide partial support for the findings of Hemanand et al. (2022), who report that AI's prediction accuracy for green-finance-related data sets is extremely high and, accordingly, positively affects the perception of its ability to contribute to Green Finance.

Finally, the analysis also suggests that the respondents who were familiar with the concepts and terms related to Green Finance prior to the survey have a significantly more positive perception of the role of AI in Green Finance than those who were not familiar with them, which is reflected in the high value of the t -test. Although their initial perception of Green Finance was not significant in determining the level of integration, it nonetheless positively contributed to the participants' perceptions alongside the perception of AI. This suggests that there are two courses of action in promoting Green Finance in India: promoting awareness of AI's role in finance and promoting awareness of Green Finance itself. In practice, this could mean that robo-advisory platforms, which provide automated investment recommendations based on ESG criteria, as well as AI-enabled green bond analysis platforms, could be used to raise awareness of Green Finance among students and young professionals, alongside targeted campaigns to promote Green Finance concepts.

9. Suggestions

Financial institutions may consider adopting AI-driven risk assessment, ESG scoring, and predictive modeling in green lending, green bonds, and other sustainable finance products to enhance decision-making, transparency, and accuracy in Green Finance.

Regulators (RBI, SEBI, etc.) may develop guidelines pertained to AI-enabled Green Finance instruments, emphasizing data privacy, algorithmic accountability, and disclosure policies, which promote transparency while balancing innovation and consumer confidence.

Banks and NBFCs may consider designing AI-enabled robo-advisory and digital platforms for Green and ESG Finance products because respondents who expressed greater confidence in Green Finance also displayed higher receptiveness to Artificial Intelligence.

Since awareness about Green Finance ($M = 3.00$) trails behind that of AI ($M = 4.28$), banks may organize informational events, workshops, and social media campaigns related to Green Finance and ESG principles alongside promoting AI-enabled products, which would raise environmental literacy, especially among students and young workers who comprise many future investors.

Universities and colleges may consider integrating Green Finance and AI into syllabi and offering specialized courses on ESG and AI-driven financial technologies, as students with greater familiarity with Green Finance principles exhibited marginally higher confidence levels in the association with AI ($t = 2.65$; $p = .009$).

Policy-makers envisioning Viksit Bharat 2047 may promote AI-driven sustainable finance fintechs via tax incentives, regulatory sandboxes, and strategic partnerships, as this study reveals AI's association with sustainable finance yields the maximum confidence across all variables.

Researchers may revisit this study by replicating the findings with larger and more diverse populations, stratified by occupation or segment (investors vs. corporates vs. others) to ascertain if the findings generalize across India's heterogeneous investor base.

10. Conclusion

This study provides empirical evidence for the existence of a strong positive correlation between the perception of Artificial Intelligence and Green Finance among respondents. This finding contributes to the existing body of literature by highlighting the potential for AI technologies to drive more efficient, transparent and responsible green financial practices. In Viksit Bharat 2047, financial institutions, regulators and academia should therefore prioritise (i) integrating AI-based risk assessment and ESG monitoring mechanisms in green financial products, (ii) conducting awareness campaigns targeting the significant Green Finance knowledge gap (which the current study demonstrates as negatively affecting trust in AI-Green Finance mechanisms among students), and (iii) designing regulatory sandboxes for AI-enabled green financial instruments. While the convenience sample of 160 students used in this study allows for cautious generalisations of these findings, further research is required to confirm these trends at larger population levels and across different career groups and industries.

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