FROM CAPITAL TO CLIMATE: THE ROLE OF ARTIFICIAL INTELLIGENCE IN ADVANCING GREEN FINANCE IN INDIA

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ABSTRACT

Green finance has emerged as a critical instrument for promoting sustainable development and addressing climate change challenges. In India, the growing focus on renewable energy, sustainable infrastructure, and environmental risk management has increased the demand for innovative financial solutions. Artificial Intelligence (AI), with its advanced data-processing and predictive capabilities, has the potential to significantly strengthen green finance mechanisms. This paper examines the role of AI in advancing green finance in India using secondary data sources such as academic literature, policy reports, institutional publications, and global sustainability frameworks. The study highlights how AI supports climate risk assessment, ESG evaluation, sustainable investment decision-making, and regulatory compliance. It also discusses key challenges related to data quality, governance, and infrastructure. The paper concludes that AI can play a transformative role in aligning capital flows with climate goals, provided supportive policies and institutional frameworks are developed.

Keywords: Artificial Intelligence, Green Finance, Climate Risk, ESG, Sustainable Development, India

1. INTRODUCTION

Climate change and environmental degradation pose significant threats to economic stability and long-term development. In response, financial systems worldwide are shifting toward sustainability-oriented models, commonly referred to as green finance. Green finance includes financial instruments and investments that support environmentally sustainable projects such as renewable energy, clean transportation, energy efficiency, and climate adaptation initiatives.

India, as one of the world's fastest-growing economies, faces the dual challenge of sustaining economic growth while addressing environmental concerns such as carbon emissions, air pollution, and resource depletion. In this context, Artificial Intelligence (AI) has emerged as a powerful technological tool capable of reshaping financial decision-making. By enabling advanced analytics, automation, and predictive modeling, AI offers new possibilities for strengthening green finance frameworks in India.

2. REVIEW OF LITERATURE

Existing literature highlights the increasing integration of digital technologies into financial systems. Studies indicate that AI is widely used in conventional finance for credit scoring, fraud detection, portfolio optimization, and algorithmic trading. Recent research extends these applications to sustainable finance and environmental risk management.

Scholars emphasize that AI can improve Environmental, Social, and Governance (ESG) assessment by processing large volumes of structured and unstructured data. Reports by international organizations note that AI-driven climate models can support financial institutions in understanding physical and transition risks related to climate change. Indian studies focus on the evolution of green bonds, sustainable banking practices, and regulatory initiatives, though research explicitly linking AI with green finance in India remains limited. This gap underscores the relevance of the present study.

3. OBJECTIVES OF THE STUDY

The objectives of this paper are:

1. To examine the concept and significance of green finance in India

2. To analyze the role of Artificial Intelligence in advancing green finance

3. To identify challenges in the adoption of AI for green finance in India

4. To suggest policy and strategic measures for effective integration of AI in green finance

4. RESEARCH METHODOLOGY

4.1 Nature of the Study
The study is **descriptive and analytical**, based exclusively on **secondary data**.

4.2 Sources of Secondary Data

Secondary data were collected from:
- Research journals and academic publications
- Reports from the Reserve Bank of India (RBI) and SEBI
- Publications of the World Bank, UNEP Finance Initiative, and OECD
- Government policy documents on climate finance and digital innovation
- Reputed websites and sustainability reports

4.3 Method of Analysis
The collected data were analyzed using **thematic and conceptual analysis**, focusing on identifying patterns, trends, and relationships between AI and green finance.

5. ROLE OF ARTIFICIAL INTELLIGENCE IN ADVANCING GREEN FINANCE

5.1 Climate Risk Assessment
AI enables financial institutions to assess climate-related risks more accurately by analyzing historical climate data, satellite imagery, and economic indicators. Machine learning models help predict physical risks such as floods, droughts, and heatwaves, allowing banks and investors to factor climate risks into lending and investment decisions.

5.2 ESG Evaluation and Sustainable Investing
AI-powered tools can analyze corporate disclosures, sustainability reports, and media content using natural language processing (NLP). This improves the accuracy and consistency of ESG scoring and supports investors in identifying genuinely sustainable projects.

5.3 Green Credit Allocation
AI enhances credit assessment for green projects by incorporating environmental performance indicators along with traditional financial metrics. This supports better pricing of risk and encourages financing for renewable energy, clean technology, and sustainable infrastructure projects.

5.4 Monitoring and Reporting
AI facilitates real-time monitoring of environmental outcomes through data analytics and remote sensing technologies. This strengthens transparency and accountability in green finance initiatives and helps institutions meet regulatory and reporting requirements.

6. CHALLENGES IN USING AI FOR GREEN FINANCE IN INDIA
Despite its potential, the integration of AI into green finance faces several challenges:

- **Data Limitations:** Inconsistent and fragmented environmental data reduce the effectiveness of AI models.
- **Regulatory Gaps:** Lack of standardized ESG reporting frameworks complicates AI-driven analysis.
- **Technological Constraints:** Smaller financial institutions may lack access to advanced AI infrastructure.
- **Ethical and Transparency Issues:** Concerns related to algorithmic bias and explainability remain significant.

7. POLICY IMPLICATIONS AND RECOMMENDATIONS
To strengthen AI-driven green finance in India, the following measures are suggested:

1. Development of standardized ESG and climate data frameworks
2. Encouragement of public–private partnerships for AI innovation

3. Capacity-building programs in AI and sustainable finance

4. Regulatory guidelines ensuring ethical and transparent AI usage

5. Support for fintech and green innovation ecosystems

8. CONCLUSION

The transition from capital-driven finance to climate-oriented finance is essential for sustainable development in India. Artificial Intelligence has the potential to accelerate this transition by improving risk assessment, enhancing ESG evaluation, and supporting informed investment decisions. However, realizing this potential requires coordinated efforts in data governance, regulation, infrastructure development, and skill enhancement. With appropriate policy support and institutional readiness, AI can play a transformative role in advancing green finance and aligning India's financial system with its climate goals.

9. REFERENCES (INDICATIVE)

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