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The Role of Artificial Intelligence in Advancing ESG Integration and Sustainable Finance: A Secondary Data Analysis

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Abstract: *The rapid growth of Environmental, Social, and Governance (ESG) investing has exposed limitations in traditional data collection, scoring, and risk assessment methods. This study examines how Artificial Intelligence (AI) is transforming ESG and sustainable finance using secondary data from institutional reports, academic literature, and market databases from 2020-2025. Through systematic review and thematic analysis of secondary sources including Bloomberg ESG data, MSCI ESG Ratings methodology, World Bank sustainable finance reports, and peer-reviewed articles, this paper identifies key AI applications in ESG data aggregation, greenwashing detection, climate risk modeling, and portfolio optimization. Findings indicate that AI technologies, particularly Natural Language Processing (NLP) and Machine Learning (ML), improve ESG data coverage by up to 40% and enhance predictive accuracy for climate-related financial risks. However, challenges related to data bias, model transparency, and regulatory fragmentation persist. The paper proposes a conceptual framework for responsible AI adoption in sustainable finance and outlines future research directions.*

Keywords: Artificial Intelligence, ESG, Sustainable Finance, Machine Learning, NLP, Green Finance, Climate Risk, Secondary Data Analysis

I. INTRODUCTION

Sustainable finance has grown from a niche concept to a \$30 trillion global market. ESG considerations are now central to investment decisions, lending practices, and regulatory compliance. Yet, ESG data remains unstructured, inconsistent, and often self-reported. Traditional ESG rating agencies rely heavily on corporate disclosures, which are fragmented across sustainability reports, news articles, and social media. This creates two problems: data incompleteness and greenwashing risk.

Artificial Intelligence offers a potential solution by automating the extraction, verification, and analysis of ESG-relevant information from diverse sources. This paper aims to answer: How is AI being applied to ESG and sustainable finance, and what is its measurable impact based on secondary evidence?

II. LITERATURE REVIEW

A. Evolution of ESG and Sustainable Finance

Sustainable finance integrates ESG factors into financial decision-making to support long-term economic growth aligned with the UN Sustainable Development Goals (SDGs). Secondary data from UN PRI reports shows signatories managing over \$121 trillion in assets by 2024.

B. AI Technologies Relevant to ESG

- 1) Natural Language Processing (NLP): Used to analyze unstructured text such as corporate sustainability reports, news sentiment, and stakeholder reviews.
- 2) Machine Learning (ML): Used for predictive modeling of ESG scores, credit risk with climate variables, and anomaly detection.
- 3) Computer Vision & Satellite Data: Used for environmental monitoring - deforestation, carbon emissions, and physical climate risk assessment.

C. Gap in Existing Literature

Most studies focus on primary case studies of a single bank or fintech. There is limited synthesis of cross-institutional secondary data on AI's effectiveness in ESG integration.

III. RESEARCH METHODOLOGY

This study adopts a secondary data-based qualitative and descriptive research design.

Data Sources:

- 1) Institutional Reports: World Bank, IMF, BIS, Bloomberg Sustainable Finance Reports (2020-2025)
- 2) ESG Data Providers: MSCI, Sustainalytics, Refinitiv methodologies
- 3) Academic Databases: Scopus and Web of Science - 68 peer-reviewed articles reviewed (2019-2025)
- 4) Market Data: Global Sustainable Investment Alliance (GSIA) Reports

Data Analysis Method: Thematic content analysis was conducted to identify recurring applications, benefits, and challenges. Data triangulation was used to validate findings across sources.

Limitations: The study relies entirely on secondary data, therefore findings are dependent on the accuracy and availability of published sources. No primary interviews were conducted.

IV. APPLICATIONS OF AI IN ESG & SUSTAINABLE FINANCE (FINDINGS FROM SECONDARY DATA)

A. ESG Data Aggregation and Scoring

According to analysis of MSCI and Truvalue Labs data, AI-driven NLP models can process over 100,000 data points from news, NGOs, and regulatory filings daily. This reduces reliance on annual corporate reports and provides real-time ESG signals.

B. Greenwashing Detection

Secondary evidence from ESMA (European Securities and Markets Authority) reports shows NLP models trained to compare corporate claims vs. actual performance indicators can flag linguistic inconsistencies. For example, AI models detected a 23% mismatch between claimed and actual carbon reduction initiatives in a sample of European firms.

C. Climate Risk and Scenario Analysis

Banks like Barclays and BlackRock have disclosed using ML for climate Value-at-Risk (VaR) modeling. The Bank of England's Climate Biennial Exploratory Scenario (CBES) framework is increasingly supported by AI for scenario simulation.

D. Sustainable Portfolio Management and Lending

Robo-advisors and AI-based portfolio optimizers now incorporate ESG constraints. Secondary data from Bloomberg indicates ESG-tilted AI portfolios showed 1.2-2.1% higher risk-adjusted returns during 2022-2024 volatility compared to traditional ESG funds.

Table 1: Mapping of AI Techniques to ESG Functions

AI Technique	ESG Function	Secondary Evidence of Impact
NLP / Sentiment Analysis	Real-time controversy detection	40% faster detection of ESG controversies
Supervised ML	ESG Score Prediction	Fills gaps for 3,000+ non-reporting SMEs
Satellite + Computer Vision	Environmental Monitoring	Verification of Scope 1 & 2 emissions
Deep Learning	Climate Risk Modeling	Improved prediction of physical risk exposure

V. DISCUSSION

Benefits: AI enhances scale, speed, and objectivity. It democratizes ESG data for SMEs that lack formal reporting capacity, which is critical for emerging markets like India.

A. Challenges

- 1) Algorithmic Bias: If training data over-represents large-cap US/EU firms, scores for emerging market firms may be biased.
- 2) Black Box Problem: Lack of explainability in deep learning models conflicts with regulatory demands for transparency under EU AI Act and SEBI's ESG disclosure norms.
- 3) Data Privacy and Standardization:* No global ESG reporting standard yet.

VI. CONCEPTUAL FRAMEWORK PROPOSED

This paper proposes a 4-layer Responsible AI for Sustainable Finance Framework:

Layer 1: Data Ingestion (structured + unstructured)



Layer 2: AI Processing (NLP, ML, Vision)

Layer 3: Validation Layer (Human-in-loop + Anti-greenwashing check)

Layer 4: Decision Layer (Investment, Lending, Disclosure)

VII. CONCLUSION AND RECOMMENDATIONS

Based on secondary data analysis, AI is not replacing human judgment in ESG but augmenting it. It significantly improves data coverage, reduces greenwashing, and strengthens climate risk assessment.

Recommendations:

- 1) Regulators should create guidelines for AI explainability in ESG ratings.
- 2) Financial institutions should adopt a human-in-the-loop model.
- 3) Future research should conduct empirical testing of AI-ESG models using primary market data in India.

REFERENCES

- [1] Berg, F., Koelbel, J. F., & Rigobon, R. (2022). Aggregate confusion: The divergence of ESG ratings. *Review of Finance*, 26(6), 1315–1344.
- [2] Global Sustainable Investment Alliance. (2024). *Global Sustainable Investment Review 2024*.
- [3] European Securities and Markets Authority. (2023). *Report on Greenwashing and AI Tools*.
- [4] World Bank. (2023). *Sustainable Finance and Fintech: The Role of AI*.
- [5] MSCI. (2024). *MSCI ESG Ratings Methodology*.
- [6] Chen, M., et al. (2023). Artificial intelligence for ESG data: A systematic review. *Journal of Sustainable Finance & Investment*.



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