Exploring the Integration Among Artificial Intelligence, Fintech, and Sustainable Investing in ESG Funds in India: A Bibliometric Perspective

Durgesh Bahuguna[a], Rajesh Tiwari[b] and Sanjay Taneja[c]
Department of Management, Graphic Era (Deemed to be University), Dehradun, India

Keywords: AI, ESG Funds, Sustainable Investing, Financial Technology.

Abstract: Although various research studies have been done on the topics of sustainable finance, financial technology, and ESG funds, particularly over the decades, more research studies are still required to clarify the strength and integration between these research areas. The objective of this research is to find the connection and integration between financial technology, sustainability, and ESG funds through a bibliometric and systematic literature approach using VOS-Viewer software and the Scopus database. The study has different results. Regarding keywords, sustainable development, financial technology, and finance have maximum link strength. From the viewpoint of co-citation analysis, resource policy is the source with the maximum citations, followed by environment and science. The best quality papers are provided by the top three countries: Germany, Bahrain, and the United Kingdom. The University of Bahrain is the top-ranked university that has produced the maximum documents on the keywords sustainable investing, financial technology, and ESG. Eventually, the research article emphasizes upcoming research challenges, limitations, and directions.

1 INTRODUCTION

The financial institutions are greatly affected by evolving and developing technologies that have made dynamic changes in transferring money globally (Macpherson et. al., 2021). AI, Sustainable finance, ESG funds, and financial technology have become integral parts of financial development. Financial technology is such a phenomenon that is affecting companies, institutions, financial sectors, stakeholders, investors, researchers, managers, ESG, and sustainability (Thottoli, 2024). However, sustainability and financial technology have not yet been adequately explored and determined (Taneja et al., 2024). The advancement of sustainable development on the basis of sustainable financial technology has gained attention from financial institutions rather than economic growth (Colledge, 2017). Very few studies are researching the topic of how AI, financial technology and sustainability are affecting each other (Vergara and Agudo, 2021). According to a recent and unique study, the adoption of Financial Technology has a favourable and harmonized impact on enterprises' environmental and social sustainability performance (Siddik et al., 2023). A number of research studies have been reviewed pertaining to Environmental Social Governance issues, mostly emphasizing ESG performance and ESG disclosure (Jain et al., 2023; Galletta et al., 2022). It is noteworthy that research concentrating on specific Financial Technology concerns that either indirectly or directly integrate with sustainability themes is starting to be conducted. AI and Machine Learning are helping hands in different sectors for the evaluation of Sustainable finance and ESG funds through Neural Networks, Algorithms, Models, and Software. AI in the context of ESG minimizes risk while maximizing its benefits (Xu, 2024).

[a] https://orcid.org/0009-0007-7782-6862
[b] https://orcid.org/0000-0002-5345-2508
[c] https://orcid.org/0000-0002-3632-4053

Bahuguna, D., Tiwari, R. and Taneja, S.
Exploring the Integration Among Artificial Intelligence, Fintech, and Sustainable Investing in ESG Funds in India: A Bibliometric Perspective.
DOI: 10.5220/0013586700004664

In *Proceedings of the 3rd International Conference on Futuristic Technology (INCOFT 2025) - Volume 2*, pages 65-70
ISBN: 978-989-758-763-4

2 LITERATURE REVIEW

Policy makers who care about the development goals based on sustainability, as well as research scholars studying the effects of digitalization and technology, have a keen interest in financial technology and sustainability (Ellili, 2022). Financial inclusion is mainly motivated by financial technology; this, in turn, supports balanced and sustainable development. Financial technology, financial inclusion, and sustainability have the tremendous power to change the whole society, finance, and economy (Arner et al., 2022). Social impact is a factor that promotes technology adoption in the banking industry, and it is powered by ESG aspects. It is reasonable for institutions to organize financial technology training sessions for managers and staff in order to enhance their comprehension of ESG topics and enable more effective implementation of sustainable practices (Galeone et al., 2024). The most important factor influencing corporate social responsibility performance is inclusive finance and corporate ESG performance. This also plays a vital role in helping corporations satisfy their environmental obligations. The development of inclusive finance has the potential to boost companies' green technology innovation, which in turn raises corporate green sustainability and boosts corporate ESG performance (Li and Pang, 2023). Two key fundamentals of the current E.U. policy agenda are the Sustainable Finance Strategy and the Digital Finance Action Plan. There is an in-depth link between sustainability, finance, and financial technology, which provides us protection in pandemics like COVID-19 (Macchiavello and Siri, 2023). The most appropriate measure to use for evaluating how the ESG factor is affecting a firm is its market value. ESG development will boost the situation of the firm and would lead the performance upward (Gorova et al., 2022). Financial technology will undoubtedly revolutionize banking services and institutions more quickly. The traditional system of banks should remember that society has the ability to push for the things that will improve their lives (Kashif et al., 2023). Technological improvements and advancements have not only revolutionized businesses but have also optimized several financial services' functional areas. In addition, fintech and green finance are crucial instruments for achieving goals for sustainable development. Green finance, green technology, and green innovation aid in the fulfilment of sustainable development objectives (Khalil et al., 2023). Financial technology improves ESG. Nevertheless, natural resource dependence limits the influence of financial technology's improvement on corporate ESG. Financial technology's ability to accelerate digital transformation and minimize financial barriers can have an impact on corporate ESG (Sang et al., 2024).

3 METHOD

In this research study, we used bibliometric methods in integration with literature review analysis to evolve the participation between financial technology, sustainability, and ESG funds. Bibliometric analysis helps to define, analyze, visualize, and compare the data (Żarczyńska, 2009). Review quality has been improved through visualization and a systematic method of analysis (Ankenbrand et al., 2024). Data is collected from the Scopus database in the form of a CSV file. Financial Technology, Sustainable Finance, and ESG were the key terms used in searching the data in the Scopus database. The data belongs to the years 2017 to 2024 (8 years). A total of 224 documents were found, comprising articles, book chapters, books, etc. The date of retrieval was May 15, 2024. Articles that were not written in English were removed from the CSV file, as well as articles that were not exactly related to our topic, which were also excluded from the data. VOS-Viewer 1.6.20 version was used to analyze citation analysis, co-citation analysis, co-authorship analysis, co-occurrence analysis, and bibliographic coupling.

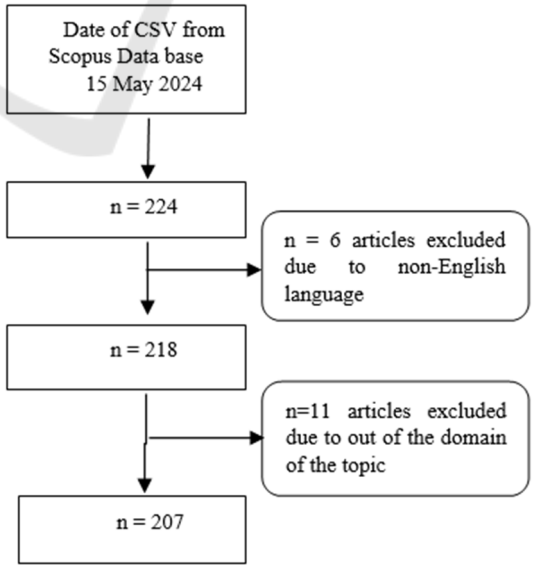

Figure 1: Inclusion and Exclusion Criteria

4 RESULTS

The publication has increased from 1 in 2017 to 61 in 2024. In the year 2017, gradually the publications have increased from 5 in 2018, 5 in 2019, to 7 in 2020. The publication number became 14, and gradually the number of papers has increased year to year with a high rate of citation numbers. By the end of 2024, 24 publications with citations have been published. The publication matrix shows that year by year the quality and number of publications have increased.

Table 1: Publication Trend

Year	Total Number of Publications	Total number of Citations
2017	1	19
2018	5	46
2019	7	195
2020	14	567
2021	30	451
2022	44	567
2023	44	367
2024	61	54

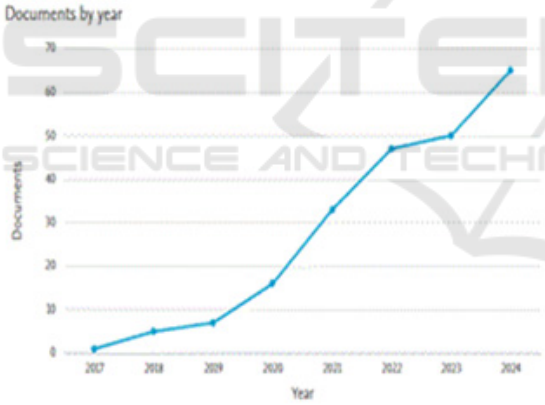

Figure 2: Yearly Trend of Publications

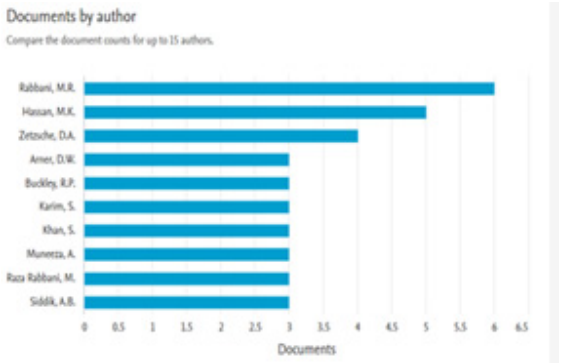

Figure 3: Prominent Authors

Rabbanim has the highest number of documents, followed by Hassan, Zetzsche, Arner, and Buckley. These authors have published the maximum number of documents in the fields of financial technology, sustainability, and ESG. The University of Bahrain has produced the maximum number of documents, followed by King Saud University, Kingdom University, Southwestern University of Finance, the University of New Orleans, City University of Macau, UNSW Sydney, and Tashkent State University, which are the top-ranked universities that have published the maximum number of documents on the same keywords.

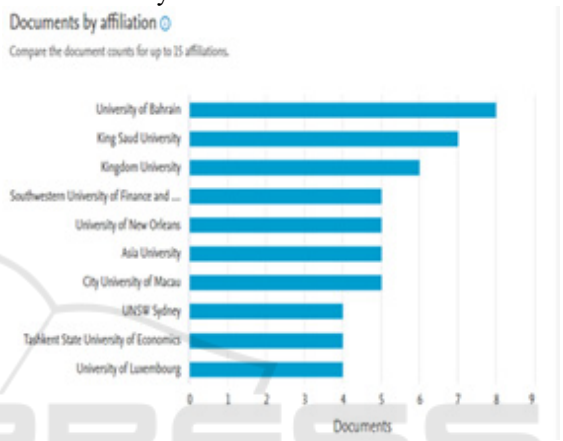

Figure.4: Prominent Organisations

Figure 5 depicts prominent countries in research on sustainable investing, ESG, and financial technology. Analyzing documents, China was listed as the top country. China has published the maximum number of documents related to key words, followed by India, the United Kingdom, the United States, Pakistan, Saudi Arabia, Italy, Bahrain, and Indonesia. Among the top ten, Indonesia is the country that has published the least number of articles.

Figure 5: Prominent Countries

Figure 6 shows the types of documents published in the maximum number. The participation of articles was highest at 126, followed by 42 book chapters, 21 conference papers, 19 books, 12 reviews, and the rest were editorial, short surveys, and errata.

Figure 7 depicts subject-wise publications. The contribution of economics, econometrics, and finance is 24 percent, which is the highest with 133 documents. Then there are 108 documents in social science, 89 documents in business, management, and accounting, 74 documents in environmental science, 46 documents in computer science, 26 documents in engineering, and the rest of the documents belong to energy, mathematics, etc."

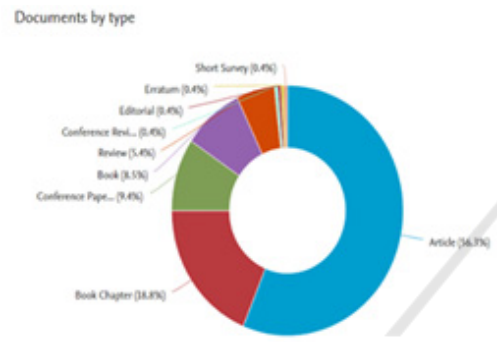

Figure 6: Documents Types

Figure 7 below shows in which subject domain it has participated the most. The contribution of the area of Economics, Econometrics, and Finance is 24 percent, which is the highest, with 133 documents. Then there are 108 documents in social science, 89 documents in Business, Management, and Accounting, 74 documents in Environmental Science, 46 documents in Computer Science, 26 documents in Engineering, and the rest of the documents belong to Energy, Mathematics, etc.

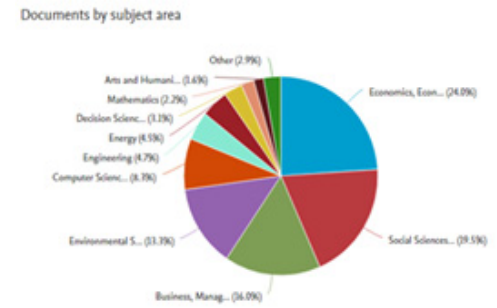

Figure 7: Documents by subject areas

The citation is related to the frequency of a paper or document; an article is used by other researchers for their research work. So, if the citation number is high, it means it is being valued or is becoming famous. Citation analysis was performed with a threshold of 5 citations. In this way, 33 countries met the criteria.

Table 2: Prominent cited countries

S.No.	Country	Documents	Citations	Link Strength
1	China	62	596	30
2	Malysia	23	426	8
3	United Kingdom	16	353	14
4	USA	17	328	6
5	India	25	292	15
6	Germany	8	268	2
7	Bahrain	10	234	6
8	Indonesia	9	182	2
9	Italy	13	155	26
10	France	7	136	6
11	Pakistan	14	119	7
12	Taiwan	8	86	4

Table 2 shows the top 12 countries with their highest citations. China holds the top position with the highest citation of 596 and a maximum of 62 documents with link strength of 30. The next country is Malaysia, having 426 citations, 23 documents, and a link strength of 8, followed by the United Kingdom with 353 citations, 16 documents, and a link strength of 14. The USA is in fourth position, having 328 citations, 17 documents, and a link strength of 6, followed by India with 292 citations, 25 documents, and a link strength of 15. Germany is in 6th position with 268 citations and 6 documents. In the same sequence, Bahrain, Italy, France, Pakistan, and Taiwan have also made a good contribution to publishing documents on the topics of sustainable investing, financial technology, and ESG. On the other hand, if we analyze the quality of documents per paper, we find that Germany ranks first, having 34 citations per paper, followed by Bahrain with 23 citations per document. Consequently, the United Kingdom (22), Indonesia (20), France (19), the USA (19), Malaysia (19), Italy (12), India (12), Taiwan (11), China (10), and Pakistan (9) are the countries in declining order of citations per document or quality work on keywords.

Figure 8: Network Map of Countries

Co-citation shows the number of documents that are cited mutually in the same research work. Briefly, we can say how many times two studies are cited mutually by other studies. Co-citation analysis evaluates the integration strength of citations in research articles that are cited together frequently. The resource policy source has the maximum citations (367), followed by environmental science and pollution control with 367 citations. The third rank goes to Sustainability (327 citations). The remaining sources are as follows: Journal of Cleaner Production (137), Energy Economics (87), Renewable Energy (83), Technological Forecasting (89), Science of the Total Environment (55), etc.

Figure 9: Co-Citation Map

Network mapping shows the integration strength of the keywords with each other. Moreover, it also explains the clusters of keywords and how they are interlinked. This analysis assists researchers in the research study of financial technology, sustainable investing, and ESG.

With a minimum number of occurrences of 7 out of the 1545 keywords, 48 meet the threshold limit. Sustainable Development has the maximum total link strength (517), followed by Financial Technology (512). In third place is Finance (474), and fourth place goes to Sustainability (369). China (330), Natural Resources (319), Environmental Sustainability (184), Environmental Economics (154), Green Finance (146), and Economics (134) are the remaining keywords that make an important contribution to the keyword mapping network.

Figure 10: Keyword Map

5 CONCLUSIONS

This paper analyzed 224 documents from the Scopus Database on AI, financial technology, and ESG funds. The research study produced various results. Regarding keywords, sustainable development has the maximum link strength, followed by AI, financial technology, and finance. In the perspective of co-citation analysis, Resource Policy is the source with the maximum citations, followed by Environment and Science. The best quality papers on the keywords were produced by Germany, with 34 citations per paper. Consequently, Bahrain, the United Kingdom, Indonesia, France, and the USA are countries that have good quality papers published. Considering the maximum citations, China is the country with the most citations on documents, followed by Malaysia, the United Kingdom, and the USA. If we consider the maximum number of documents published by authors, Rabbanim took first place, followed by Hassan, Zetzsche, and Arner, who are the best contributing authors for the keywords AI, financial technology, sustainable investing, and ESG funds. The University of Bahrain, King Saud University, Kingdom University, South-western University of Finance, and the University of New Orleans are the top five universities that have produced the maximum number of documents on the keywords. There are different methods to calculate ESG funds' performance in AI and machine learning, which are accurate for results that could lead to optimal decision-making for policymakers and professionals to maintain a sustainable environment.

6 LIMITATIONS AND FUTURE SCOPE

The research study is limited to the Scopus database; it may have ignored a few studies that exist in other databases, such as PubMed, IEEE, and ScienceDirect. Additionally, there may be other technological synonyms that could be used as crucial research phrases for future research. The combination of AI, financial technology, and ESG funds is helpful for the private sector in terms of operational achievements, sustainable growth, and reducing risks, which leads to long-term growth and highly responsible business practices. Due to the high accuracy of results provided by AI and fintech for ESG funds, the participation of AI and fintech should be increased so that a sustainable environment can be achieved. AI and machine learning are changing the global financial positions of countries; hence, the participation of AI should be encouraged in the financial system (Garfield, 1964).

REFERENCES

A. A. Gorova, S. V. Grishunin, and A. M. Karminsky, "The Impact of ESG factors on the performance of Information Technology Companies," *Procedia Computer Science*, vol. 199, pp. 339–345, 2022.

A. B. Siddik, M. N. Rahman, and L. Yong, "Do fintech adoption and financial literacy improve corporate sustainability performance? The mediating role of access to finance," *J. Clean. Prod.*, vol. 421, no. 137658, p. 137658, 2023.

A. Żarczyńska, "Nicola DE Bellis: Bibliometrics and citation analysis, from the science citation index to cybermetrics, Lanham, Toronto, Plymouth 2009," *Toruńskie Stud. Bibliol.*, vol. 5, no. 1 (8), 2012.

C. Vergara and C. Ferruz Agudo, "Fintech and sustainability: do they affect each other?," *Sustainability*, vol. 13, no. 13, pp. 1–19, 2021.

D. W. Arner, R. P. Buckley, D. A. Zetzsche, and R. Veidt, "Sustainability, FinTech and financial inclusion," *Eur. Bus. Organ. Law Rev.*, vol. 21, no. 1, pp. 7–35, 2020.

E. Garfield, *The use of citation data in writing the history of science*. Philadelphia Institute of Scientific Information, 1964.

E. Macchiavello and M. Siri, "Sustainable finance and fintech: Can technology contribute to achieving environmental goals? A preliminary assessment of 'green fintech'and 'sustainable digital finance," *European Company and Financial Law Review*, vol. 19, no. 1, pp. 128–174, 2022.

G. Galeone, S. Ranaldo, and A. Fusco, "ESG and FinTech: Are they connected?," *Res. Int. Bus. Fin.*, vol. 69, no. 102225, p. 102225, 2024

J. Xu, "AI in ESG for financial institutions: An industrial survey," *arXiv [cs.CY]*, 2024.

K. Jain and P. S. Tripathi, "Mapping the environmental, social and governance literature: a bibliometric and content analysis," *J. Strategy Manag*, vol. 16, no. 3, pp. 397–428, 2023.

L. Colledge, "Snowball metrics recipe book standardised research metrics-by the sector, for the sector," *Snowball Metrics*, vol. 2, 2017.

M. Kashif, C. Pinglu, S. Ullah, and M. Zaman, "Evaluating the influence of financial technology (FinTech) on sustainable finance: a comprehensive global analysis," *Financial Markets and Portfolio Management*, pp. 1–33, 2023.

M. M. Thottoli, "The tactician role of FinTech in the accounting and auditing field: a bibliometric analysis," *Qual. Res. Fin. Mark.*, vol. 16, no. 2, pp. 213–238, 2024.

M. Macpherson, A. Gasperini, and M. Bosco, "Artificial intelligence and FinTech technologies for ESG data and analysis," *SSRN Electron. J.*, 2021.

N. O. D. Ellili, "Is there any association between FinTech and sustainability? Evidence from bibliometric review and content analysis," *J. Fin. Serv. Mark.*, 2022.

R. G. Khalil, S. Damrah, M. Bajaher, and F. A. Shawtari, "Unveiling the relationship of ESG, fintech, green finance, innovation and susainability: case of Gulf countries," *Environmental Science and Pollution Research*, vol. 30, no. 54, pp. 116299–116312, 2023.

S. Galletta, S. Mazzù, and V. Naciti, "A bibliometric analysis of ESG performance in the banking industry: From the current status to future directions," *Res. Int. Bus. Fin.*, vol. 62, no. 101684, p. 101684, 2022.

S. Taneja, A. Siraj, L. Ali, A. Kumar, S. Luthra, and Y. Zhu, "Is FinTech implementation a strategic step for sustainability in today's changing landscape? An empirical investigation," *IEEE Trans. Eng. Manage.*, pp. 1–13, 2024.

T. Ankenbrand, D. Bieri, L. ReichmuthL. "IFZ FinTech Study". 2024.

W. Li and W. Pang, "The impact of digital inclusive finance on corporate ESG performance: based on the perspective of corporate green technology innovation," *Environ. Sci. Pollut. Res. Int.*, vol. 30, no. 24, pp. 65314–65327, 2023.

Y. Sang, M. Xie, X. Bai, and F. Guo, "Does natural resource dependence influence the impact of financial technologies on corporate ESG and digital governance in China's listed enterprises?," *Resour. Policy*, vol. 91, no. 104948, p. 104948, 2024.