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Integrating ESG into Islamic Finance through Artificial Intelligence: A bibliometric analysis

BOUMAZZOURH Youness[1]*, **AMZIL Laila** [2],

[1] *Business Management (LARGE), National School of Commerce and Management, Agadir, Morocco*
[2] *Business Management (LARGE), National School of Commerce and Management, Agadir, Morocco*

*Corresponding author: youness.boumazzourh@edu.uiz.ac.ma

Abstract

Islamic finance is increasingly recognized as a values-driven framework capable of supporting global sustainability goals through its ethical, interest-free, and socially responsible foundations. Meanwhile, Environmental, Social, and Governance (ESG) criteria and Artificial Intelligence (AI) are reshaping the landscape of modern financial systems. This paper conducts a bibliometric review that charts the evolution of research at the intersection of Islamic finance, ESG integration, and AI applications by identifying publication trends, leading contributors, and key thematic structures within this emerging field. Core research themes include Shariah-compliant ESG screening, AI-driven financial decision-making, and ethical fintech platforms. The geographic spread of research is primarily anchored in Southeast Asia and the Middle East, with growing international collaboration involving Europe and North America. Emerging trends highlighted in the analysis include the convergence of AI and Islamic ethical principles, the rise of digital Shariah governance tools, and the development of sustainable Islamic financial products such as green sukuk. These findings offer critical insight into the intellectual structure and future direction of this interdisciplinary domain and position Islamic finance as a strategic driver of sustainable and technologically integrated financial transformation.

Keywords: Islamic Finance; ESG; Artificial Intelligence; Shariah Compliance; Sustainable Finance; Ethical Investment; Bibliometric Review.

JEL classification: QG3, M14, Q56, Z12

1. Introduction

Over the past decade, the integration of Environmental, Social, and Governance (ESG) criteria into financial decision-making has gained significant global momentum. Sustainable investments reached approximately USD 30.7 trillion in 2018, marking a 34% increase within two years, largely driven by evolving regulatory frameworks and growing investor demand for ethically aligned finance (Global Sustainable Investment Alliance, 2019). ESG's rise has not only reshaped investment priorities but also emphasized the importance of transparency, accountability, and long-term value creation.

Simultaneously, Artificial Intelligence (AI) has become a transformative force across the financial sector. AI technologies-particularly machine learning, big data analytics, and natural language processing-are now used extensively to improve operational efficiency, risk management, and decision-making accuracy in both conventional and alternative financial institutions (Russell & Norvig, 2021).

Islamic finance, a globally expanding industry valued at approximately USD 2.7 trillion, operates under Shariah law, which emphasizes fairness, risk-sharing, prohibition of interest (riba), and ethical investments (Dey et al., 2024). These core principles align closely with ESG's foundational values such as justice, environmental stewardship, and social welfare. Both frameworks emphasize ethical conduct, responsible governance, and long-term societal benefit, indicating a conceptual and ethical overlap.

Despite this convergence, practical and structural challenges persist when attempting to align ESG standards with Islamic financial principles. Certain ESG-compliant assets may involve interest-bearing instruments or businesses that conflict with Shariah tenets, while some Shariah-compliant investments may not meet international ESG benchmarks. This misalignment calls for nuanced approaches that respect both value systems. In this context, AI presents an opportunity to operationalize this integration. For instance, AI-driven screening tools can process ESG datasets and Islamic ethical filters simultaneously, enhancing due diligence, transparency, and compliance (Najib et al., 2025).

Accordingly, this research investigates the following central question: How can Artificial Intelligence enable the integration of ESG principles into Islamic Finance while ensuring Shariah compliance and promoting ethical sustainability?

Addressing this question is both timely and essential, given the growing demand for financial systems that are not only technologically advanced but also ethically grounded. By exploring the convergence of ESG, Islamic finance, and AI, this study contributes to an emerging interdisciplinary discourse that seeks to reconcile modern financial innovation with traditional ethical values. It aims to clarify how AI can serve as a bridge-technically and morally-between sustainability objectives and Shariah principles, offering new models for responsible investment and inclusive financial development in Muslim and non-Muslim societies alike.

2. Literature review

Given the overlapping ethical objectives yet structural divergences between ESG frameworks, Islamic finance, and AI technologies, a deeper investigation is required to assess how these domains intersect in scholarly discourse. Although each area has been widely examined independently, their convergence-particularly in terms of operationalizing Shariah-compliant ESG strategies through AI-remains insufficiently explored. The following section therefore outlines the methodological approach used to map and evaluate the intellectual landscape of this intersection, with the aim of identifying dominant research patterns, collaborative dynamics, and emerging thematic clusters that inform this study.

2.1. Conceptual Foundations: ESG, Shariah Finance, and Artificial Intelligence

Environmental, Social, and Governance (ESG) frameworks are designed to assess the sustainability and ethical impact of investment decisions. These frameworks guide investors to look beyond financial returns and consider a firm's responsibility toward the environment, society, and internal governance structures. ESG principles have become central to responsible investment, with global standards such as the UN Principles for Responsible Investment and the Global Reporting Initiative shaping institutional policies and asset allocation (Friede, Busch, & Bassen, 2015).

Islamic finance, guided by the ethical and legal principles of Shariah law, similarly emphasizes justice, equity, and social responsibility. Prohibitions against interest (riba), excessive speculation (gharar), and investment in harmful sectors are central to this system, along with mandates for profit-and-loss sharing and zakat (almsgiving) (Dey et al., 2024). The overarching

goal is to achieve socio-economic justice through finance, aligning closely with ESG's ethical foundations, particularly in promoting environmental stewardship and financial inclusion (Hammond, 2022).

Artificial Intelligence (AI), encompassing technologies such as machine learning, natural language processing, and deep learning, has rapidly transformed the financial sector. AI enables real-time data analysis, automated decision-making, and predictive analytics, enhancing everything from portfolio management to fraud detection. Its ability to process large, complex datasets makes AI particularly useful in ESG evaluations and compliance screening (Russell & Norvig, 2021). In theory, AI can also play a vital role in Shariah governance by automating ethical screening processes

2.2. Ethical Alignment and Tensions between ESG and Islamic Finance

While ESG and Islamic finance share common values-including transparency, ethical conduct, and social welfare-important divergences exist in application. ESG standards are often framed in secular, market-driven terms, while Shariah law is rooted in religious jurisprudence. For example, an ESG-certified investment might rely on debt financing, which violates Shariah principles due to the presence of interest-based contracts. Conversely, a Shariah-compliant project may align with Islamic ethics but fail ESG benchmarks, especially on environmental or governance criteria (Lone & Rehman, 2017).

Another challenge lies in standardization. ESG frameworks vary significantly across rating agencies and jurisdictions, leading to inconsistent assessments and, at times, accusations of greenwashing (Delmas & Burbano, 2011).

Similarly, Islamic finance lacks a universally accepted framework for Shariah compliance. These conceptual ambiguities complicate efforts to develop a unified framework that satisfies both ESG standards and Islamic jurisprudence (Lyon & Montgomery, 2015).

Nonetheless, several areas of overlap remain promising. The principle of Maqasid al-Shariah, or the objectives of Islamic law, emphasizes preservation of wealth, life, intellect, lineage, and faith-all of which resonate with ESG's goals of long-term sustainability and human dignity (Dusuki & Bouheraoua, 2011).

Furthermore, the Islamic prohibition of harm (darar) aligns with ESG's environmental and social mandates, such as reducing carbon footprints and promoting equity. These alignments provide a theoretical foundation for mutual reinforcement.

2.3. AI as a Convergence Mechanism: Opportunities and Constraints

AI offers powerful tools to facilitate the integration of ESG into Islamic finance by enabling automated, scalable, and context-sensitive ethical screening. Machine learning algorithms can analyze corporate reports, news sentiment, and sustainability ratings to determine ESG alignment, while also checking for compliance with Shariah-based exclusionary screens (Najib et al., 2025).

Natural language processing tools can also extract relevant disclosures from unstructured sources such as annual reports or social media, improving transparency in ESG-Shariah integration. These tools are particularly helpful in jurisdictions with limited regulatory disclosure requirements, enabling more equitable access to reliable sustainability data (Aribi & Arun, 2015). Moreover, AI can facilitate dynamic compliance by updating risk scores and investment eligibility in real time as corporate behaviors evolve.

However, significant challenges remain. One key concern is the "black box" nature of many AI systems, which makes it difficult to explain or verify algorithmic decisions-a major issue for both Islamic scholars and ESG auditors who require transparency and interpretability (Jobin, Ienca, & Vayena, 2019).

Another challenge is data quality: many ESG and Shariah indicators rely on subjective assessments, sparse disclosures, or inconsistent reporting. Bias in training data or model design may also result in unfair exclusions or misclassifications, undermining the ethical objectives of both ESG and Islamic finance.

Finally, AI governance itself must align with Islamic ethical principles. As AI takes on decision-making roles in finance, questions arise about accountability, fairness, and the moral responsibilities of developers and institutions. A Shariah-compliant AI governance framework-grounded in Maqasid al-Shariah and responsible innovation-will be necessary to ensure that the

technology supports, rather than compromises, the values it is meant to promote (Dey et al., 2024). aligned with Islamic jurisprudence.

3. Methodology

This study employs bibliometric analysis techniques to map the evolution and intellectual structure of research at the intersection of Islamic finance, ESG principles, and Artificial Intelligence over the past two decades. Bibliometric analysis is a quantitative approach used to evaluate, monitor, and interpret patterns in scholarly literature. First introduced by Pritchard (1969), it has since become a widely adopted method for tracing the development of research fields and identifying influential trends, contributors, and knowledge clusters (Keathley-Herring et al., 2016; Lawani, 1981; Donthu et al., 2021).

The bibliometric methodology applied in this study is particularly suitable for large and interdisciplinary bodies of literature, enabling the identification of core research themes, highly cited documents, prolific authors, and emerging scientific frontiers (Donthu et al., 2021). It allows for both performance analysis-focusing on the productivity and impact of countries, institutions, and journals-and science mapping, which visualizes thematic networks and scholarly collaborations (Salinas-Ríos & López, 2022).

For this study, the Scopus database was selected as the sole data source due to its extensive coverage of peer-reviewed journals, conference proceedings, and book chapters across disciplines. Scopus is recognized in the bibliometric research community for the accuracy and richness of its metadata, which includes citation information, author affiliations, keywords, and co-authorship data (Mishra et al., 2017; Donthu et al., 2021). Its compatibility with analytical tools such as VOSviewer and Biblioshiny makes it particularly advantageous for high-quality scientific mapping and performance visualization. By relying exclusively on Scopus, this research ensures a consistent and globally recognized dataset, minimizing indexing bias and guaranteeing metadata integrity.

Data collection was conducted in 2025 using compound keyword searches that combined three conceptual domains: (1) Islamic finance (“Islamic finance”, “Shariah compliance”, “Sukuk”, “Takaful”), (2) ESG and sustainability (“ESG”, “sustainable finance”, “green investment”, “corporate social responsibility”), and (3) Artificial Intelligence (“artificial intelligence”,

"machine learning", "predictive analytics"). The search was limited to journal articles and conference papers published between 2004 and 2024, with the term combinations required to appear in the article title, abstract, or keywords.

The final dataset comprised 531 documents drawn from 210 unique sources. These documents were authored by 920 researchers, with an average of 3.17 co-authors per paper. Approximately 27.6% of the documents represented international collaboration, reflecting growing global academic interest in the convergence of ethical finance and AI. The collection accumulated over 8,100 citations, with an average of 15.26 citations per article, demonstrating the increasing impact of this multidisciplinary research domain.

Analytical techniques recommended by Donthu et al. (2021), Vindrola-Padros and Johnson (2020), and Jurgens et al. (2018) were applied to examine the data. Performance analysis measured scientific output by country, author, institution, and source. Science mapping was used to uncover patterns in collaboration, co-citation, keyword co-occurrence, and bibliographic coupling. Thematic evolution analysis was conducted using Biblioshiny, while co-authorship and co-word networks were visualized with VOSviewer. These tools enabled the construction of thematic maps and keyword overlays, which illustrate how the field of ESG-Islamic-AI research has evolved over time and where future research opportunities may lie.

4. Results and discussion

The results of this bibliometric study are structured under five main analytical dimensions: Scientific Production, Source-Level Analysis, Author-Level Analysis, Document Impact, and Thematic Structures. Scientific output encompasses aggregated publications distributed by country, author affiliation, and institutional contribution across the 2004–2024 period. The dataset reflects a growing global collaboration across universities and regions, particularly in Southeast Asia, the Middle East, and parts of Europe and North America.

The analysis further evaluates source impact by identifying journals with the highest number of publications and citations in the fields of ESG, Islamic finance, and Artificial Intelligence. At the author level, publication productivity and citation metrics such as h-index and g-index

are used to identify the most influential scholars contributing to this interdisciplinary area. Key documents are highlighted based on local citation counts, serving as seminal works in this emerging convergence domain.

Finally, thematic development is explored through various science mapping techniques, including keyword co-occurrence networks, thematic maps, thematic evolution tracking, and bibliographic coupling. These tools allow for the identification of conceptual clusters, intellectual linkages, and potential future directions for research at the intersection of Shariah-compliant finance, sustainability standards, and intelligent systems.

4.1 Evolution of Scientific Output and Country-Level Contributions Over Time

Understanding the temporal growth of scientific publications and the geographic distribution of contributions is essential for assessing the development and global relevance of research at the intersection of ESG, Islamic finance, and Artificial Intelligence. This section presents annual publication trends and highlights the most active countries, offering insights into how scholarly attention has evolved and which regions are driving academic production in this emerging field.

Table I: Demographic Information.

Description	***Results***
MAIN INFORMATION ABOUT DATA	
Timespan	2004:2024
Sources (Journals, Books, etc)	233
Documents	531
Annual Growth Rate %	26,61
Document Average Age	3,18
Average citations per doc	9,846

References	4275
DOCUMENT CONTENTS	
Keywords Plus (ID)	2208
Author's Keywords (DE)	1601
AUTHORS	
Authors	1454
Authors of single-authored docs	106
AUTHORS COLLABORATION	
Single-authored docs	138
Co-Authors per Doc	3,07
International co-authorships %	25,42
DOCUMENT TYPES	
article	224
book	23
book chapter	107
conference paper	123
conference review	24
data paper	1

Source: Authors.

Table 1 provides a comprehensive overview of the bibliometric dataset used in this study, spanning publications from 2004 to 2024. A total of 531 documents were retrieved from 233 distinct sources, reflecting a strong and diverse scholarly foundation. The annual growth rate of 26.61% indicates a rapidly expanding research field, particularly in recent years.

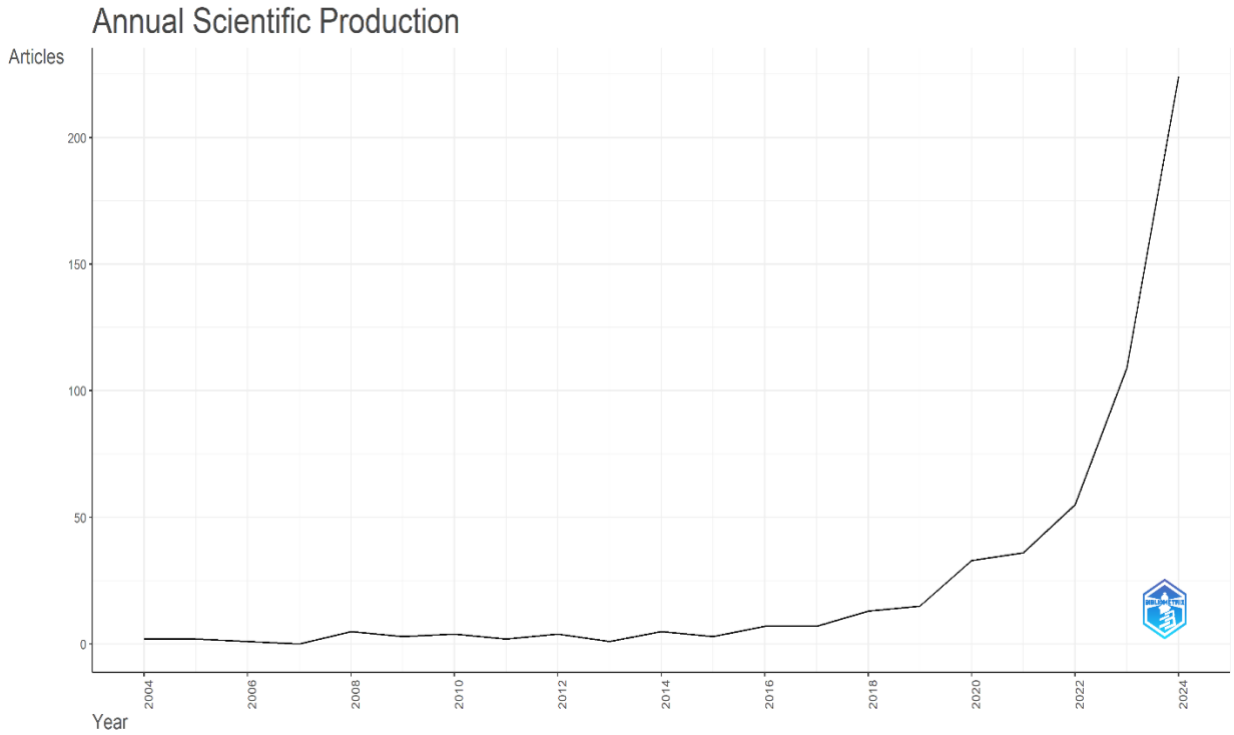
The average number of citations per document (9.85) and a total of 4,275 references highlight a moderate but consistent impact across publications.

Keyword analysis reveals 2,208 Keywords Plus (automatically generated index terms) and 1,601 Author Keywords (manually assigned), which underscores both thematic diversity and author-driven topic emphasis in the field. A total of 1,454 unique authors contributed to this literature, with 138 documents written by a single author and 3.07 average co-authors per publication-indicating a generally collaborative research environment.

The international co-authorship rate of 25.42% further suggests increasing cross-border academic partnerships, especially relevant in globally connected domains such as ESG and Islamic finance. Document types are also varied, with journal articles (224), conference papers (123), and book chapters (107) representing the bulk of contributions. This variety reflects the interdisciplinary nature of the subject and its dissemination across both academic and practitioner-oriented platforms.

Overall, the demographic profile confirms a vibrant and internationally engaged scholarly community addressing the integration of ESG, Islamic principles, and AI.

Figure I: Annual Scientific Production

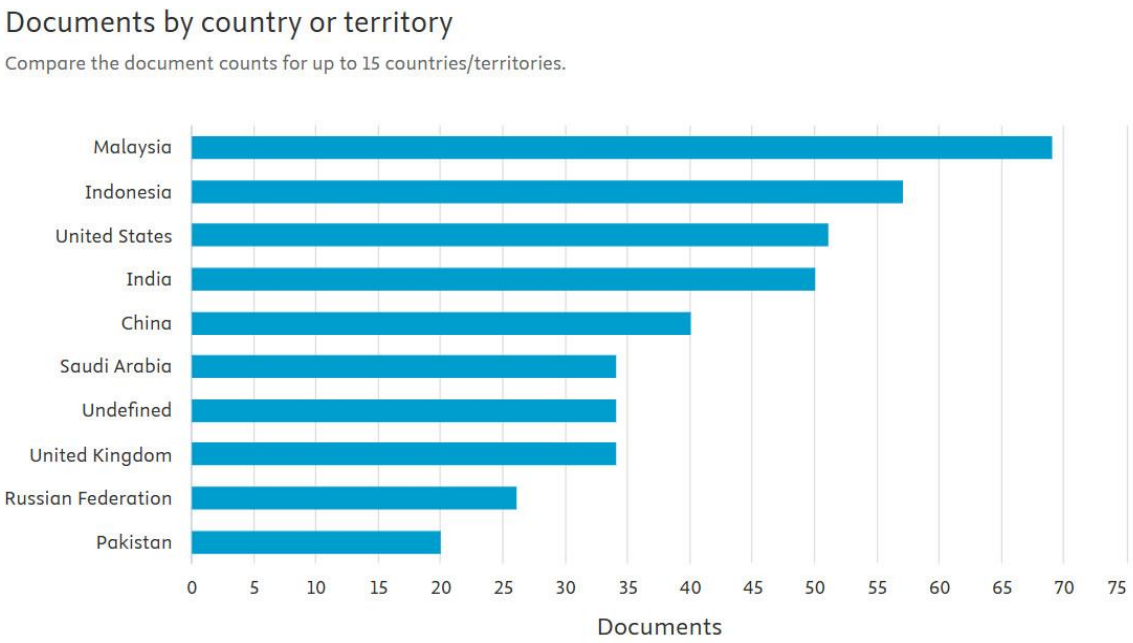


Source: Authors.

The temporal evolution of scientific output reveals a significant acceleration in publications

related to ESG, Islamic finance, and AI beginning around 2018. While the period from 2004 to 2015 was characterized by low and relatively stable activity, the post-2019 phase shows exponential growth, culminating in a peak of over 200 documents in 2024. This sharp increase reflects the rising academic interest and policy relevance of ethical and sustainable financial technologies in the digital age.

Figure II: Countries' Scientific Production



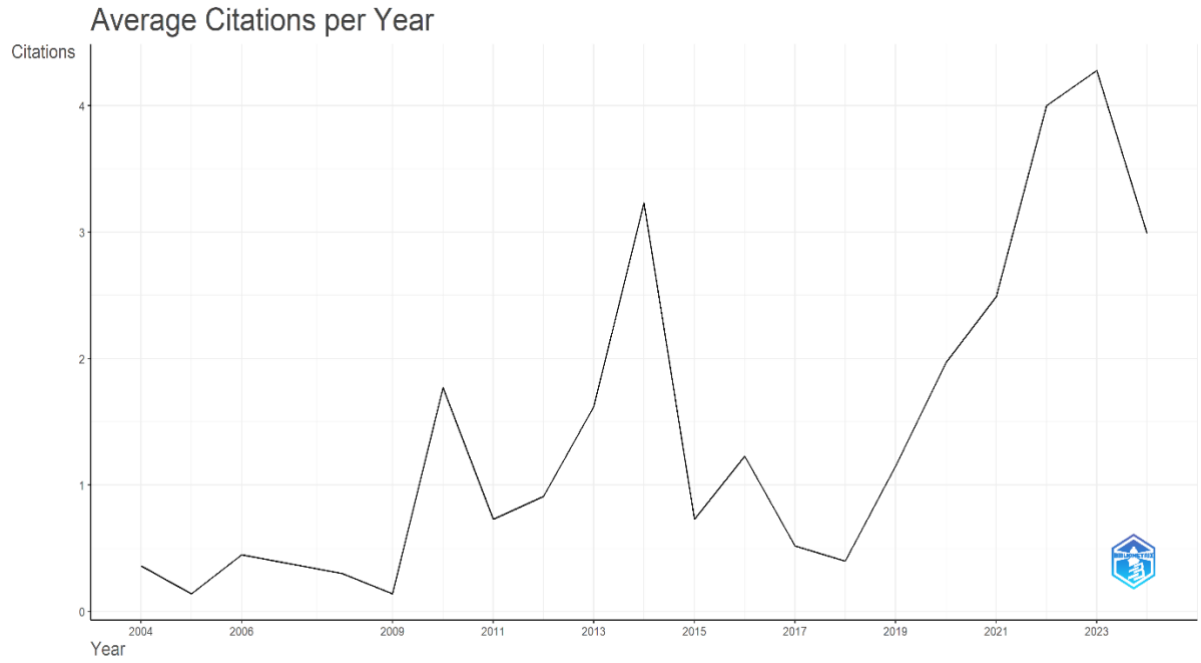
Source: Authors.

Geographical distribution highlights Malaysia as the most prolific contributor, followed by Indonesia, the United States, and India. The prominence of Southeast Asian countries, particularly Malaysia, underscores the region's leadership in Islamic finance research. Simultaneously, contributions from the United States, United Kingdom, and China reflect the global relevance and interdisciplinary appeal of the topic, especially as it intersects with sustainability and artificial intelligence.

4.2 Average Citation Impact and Top Cited Countries

Analyzing citation metrics provides valuable insights into the academic influence and visibility of research contributions across different regions. This section examines the average number of citations per year and identifies the countries whose publications have received the highest scholarly attention, offering an indication of thought leadership and impact within the ESG–Islamic finance–AI research nexus.

Figure III: Average Citations per Year



Source: Authors.

The figure illustrates a fluctuating citation trend from 2004 to 2024, with a noticeable rise in scholarly impact beginning in 2019. The peak in average citations was reached in 2023, exceeding four citations per article, indicating a recent intensification of academic attention to the convergence between ESG, Islamic finance, and AI. Earlier years show sporadic citation activity, suggesting limited visibility and diffusion at the time.

Figure IV: Most Cited Countries

Source: Authors.

China, Indonesia, and Malaysia emerge as the most cited countries, reflecting both strong research output and international scholarly relevance. The United Kingdom and the United States also display high citation counts, supported by a balanced mix of single-country and collaborative publications. The presence of multiple-country publications (MCPs) in countries such as Saudi Arabia, Germany, and Australia underscores the growing internationalization of research efforts in this field.

4.3 Most relevant sources and impact

Identifying the most influential academic journals provides insights into the primary outlets through which knowledge on ESG, Islamic finance, and Artificial Intelligence is disseminated. This section highlights the sources with the highest number of publications and citations, offering a perspective on the academic platforms that shape discourse and contribute significantly to the development of this interdisciplinary field.

Table II: Sources impact over time.

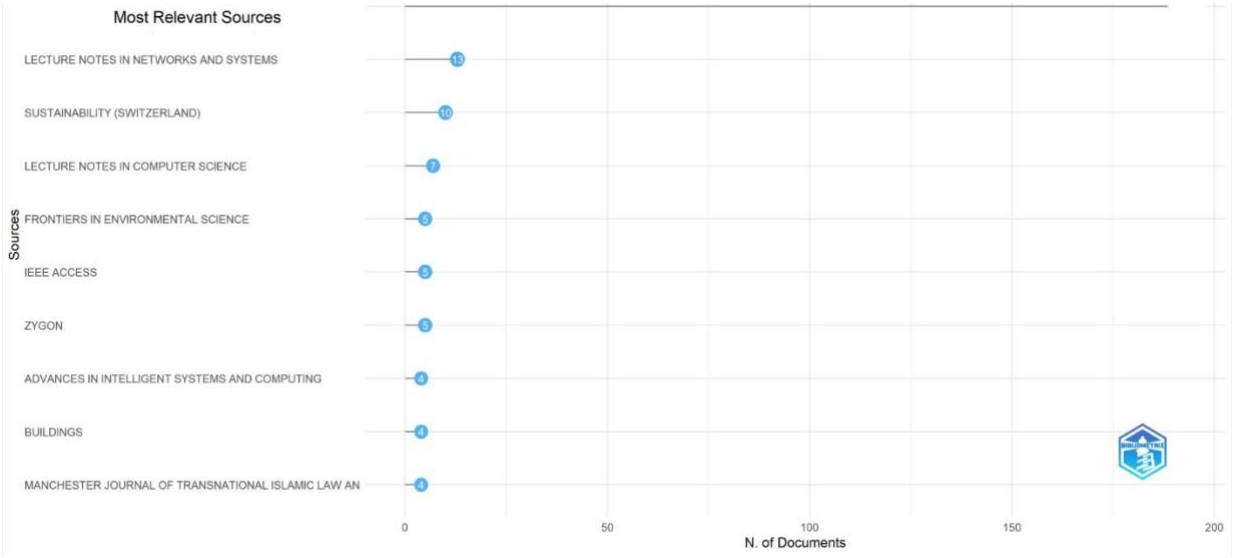
SOURCE	H_INDEX	G_INDEX	M_INDEX	TC	NP	PY_START
SUSTAINABILITY (SWITZERLAND)	7	10	1,4	600	10	2021
ADVANCES IN INTELLIGENT SYSTEMS AND COMPUTING	4	4	0,5	28	4	2018
BUILDINGS	4	4	1,333	62	4	2023
FRONTIERS IN ENVIRONMENTAL SCIENCE	4	5	1	89	5	2022
LECTURE NOTES IN COMPUTER SCIENCE	4	4	0,19	21	7	2005
IEEE ACCESS	3	5	0,333	43	5	2017
LECTURE NOTES IN NETWORKS AND SYSTEMS	3	7	0,6	60	13	2021
TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE	3	3	1	101	3	2023
ARABIAN JOURNAL FOR SCIENCE AND ENGINEERING	2	2	0,1	58	2	2006

(TC =Total Citation, PY =Publication Year, NP =Number of Publication)

Source: Authors.

The principal bibliometric indicators of the journals contributing to the convergence of ESG, Islamic finance, and AI are detailed in Table 2. Sustainability (Switzerland) emerges as the most impactful source with 10 publications and 600 total citations, demonstrating strong academic visibility and an m-index of 1.4 since 2021. Despite a more recent entry, Buildings and Frontiers in Environmental Science also exhibit high citation performance, with m-index values of 1.33 and 1 respectively, underscoring their growing influence in recent years. Advances in Intelligent Systems and Computing and Lecture Notes in Networks and Systems maintain steady contributions, while Technological Forecasting and Social Change stands out for its concentrated academic impact, accumulating 101 citations from only three papers since 2023. These results indicate an increasing engagement of both sustainability-oriented and technologically focused journals, reflecting the interdisciplinary momentum surrounding ethical, Shariah-compliant, and data-driven financial innovation.

Figure V: Most relevant sources.



Source: Authors.

Figure 5 highlights that the most active journals in the intersection of ESG, Islamic finance, and AI are Lecture Notes in Networks and Systems and Sustainability (Switzerland), with 13 and 10 publications respectively. Other sources like IEEE Access and Frontiers in Environmental Science reflect strong engagement from technological and environmental fields. The presence of interdisciplinary journals such as Zygon and the Manchester Journal of Transnational Islamic Law and Practice underscores the growing thematic diversity within this research area.

4.4 Most contributing authors

The identification of the most contributing authors provides insights into the intellectual leadership shaping the intersection of ESG, Islamic finance, and artificial intelligence. By analyzing publication frequency and author productivity, this section highlights key scholars whose research has significantly influenced the development of this emerging field. Understanding author contributions also reveals patterns of collaboration and thematic specialization across institutions and regions.

Table III: Most contributing authors.

Authors	*Articles*	*Articles Fractionalized*
RABBANI, MUSTAFA RAZA	8	3,20
IRFAN, MOHAMMAD	6	2,08
KHAN, SHAHNAWAZ	6	2,00
SMOLO, EDIB	5	1,70
HASSAN, M. KABIR	4	1,17
KISMAWADI, EARLY RIDHO	4	2,33
NEIDERMEYER, PRESHA E.	4	0,95
ANSHARI, MUHAMMAD	3	0,70
ARDESHIRI, TOHID	3	0,45

Source: Authors.

Table 3 showcases the most prolific authors contributing to the intersection of ESG, Islamic finance, and artificial intelligence. Mustafa Raza Rabbani leads with 8 publications and a fractionalized score of 3.20, indicating a significant solo or lead authorship role in multiple studies. Mohammad Irfan and Shahnawaz Khan follow closely, each with 6 publications and fractionalized contributions of 2.08 and 2.00 respectively, suggesting consistent participation in collaborative projects. Authors such as Early Ridho Kismawadi and M. Kabir Hassan also demonstrate strong contributions, with fractionalized scores of 2.33 and 1.17. The variation in

fractionalized authorship highlights differing degrees of involvement and collaboration across research outputs.

Table IV: Authors' impact.

AUTHOR	H_INDEX	G_INDEX	M_INDEX	TC	NP	PY_START
RABBANI MUSTAFA RAZA	7	8	1,167	232	8	2020
KHAN SHAHNAWAZ	5	6	0,833	188	6	2020
NEIDERMEYER PRESHA E.	4	4	1	49	4	2022
ARDESHIRI TOHID	3	3	0,75	44	3	2022
GHALY MOHAMMED M.	3	3	1,5	16	3	2024
HASSAN M. KABIR	3	4	0,6	67	4	2021
IRFAN MOHAMMAD	3	6	1	96	6	2023
SAMSTEN ISAK	3	3	0,75	44	3	2022
SVANBERG JAN	3	3	0,75	44	3	2022
ÖHMAN PETER	3	3	0,75	44	3	2022

Note: TC =Total Citation, PY =Publication Year, NP =Number of Publication.

Source: Authors.

Table 4 presents the impact metrics of the most influential authors contributing to the scholarly development of ESG, Islamic finance, and artificial intelligence. Among them, Rabbani Mustafa Raza holds a leading position with an h-index of 7, a g-index of 8, and 232 total citations across 8 publications since 2020, reflecting both productivity and citation relevance. Khan Shahnawaz also demonstrates strong impact, with an h-index of 5 and 188 citations, indicating sustained academic engagement. Notably, Neidermeyer Presha E. and Irfan Mohammad, despite more recent entries into the field, have quickly established themselves with

commendable m-index values of 1 and 0.6, respectively. Ghaly Mohammed M., publishing in 2024, records a remarkable m-index of 1.5, signaling high early influence. These figures illustrate both the maturity of some contributors and the dynamic emergence of new voices shaping the trajectory of research at this intersection.

Table V: Most relevant affiliation.

AFFILIATIONS	COUNTRY	ARTICLES
SKOLKOVO INSTITUTE OF SCIENCE AND TECHNOLOGY	RUSSIA	8
DEPARTMENT OF ARCHITECTURAL ENGINEERING	UAE	5
DEPARTMENT OF INFORMATICS	INDONESIA	4
DEPARTMENT OF ECONOMICS AND FINANCE UNIVERSITY OF NEW ORLEANS	UNITED STATES	4
MOSCOW STATE INSTITUTE OF INTERNATIONAL RELATIONS (MGIMO)	RUSSIA	4
DEPARTMENT OF FINANCE AND ACCOUNTING KINGDOM UNIVERSITY	BAHRAIN	4
SBER AI LAB MOSCOW RUSSIAN FEDERATION	RUSSIA	4
SMOLO EDIB EFFAT UNIVERSITY JEDDAH	SAUDI ARABIA	4
ENOVATE AI SPRING	UNITED STATES	3
HSE UNIVERSITY MOSCOW	RUSSIA	3

Source: Authors.

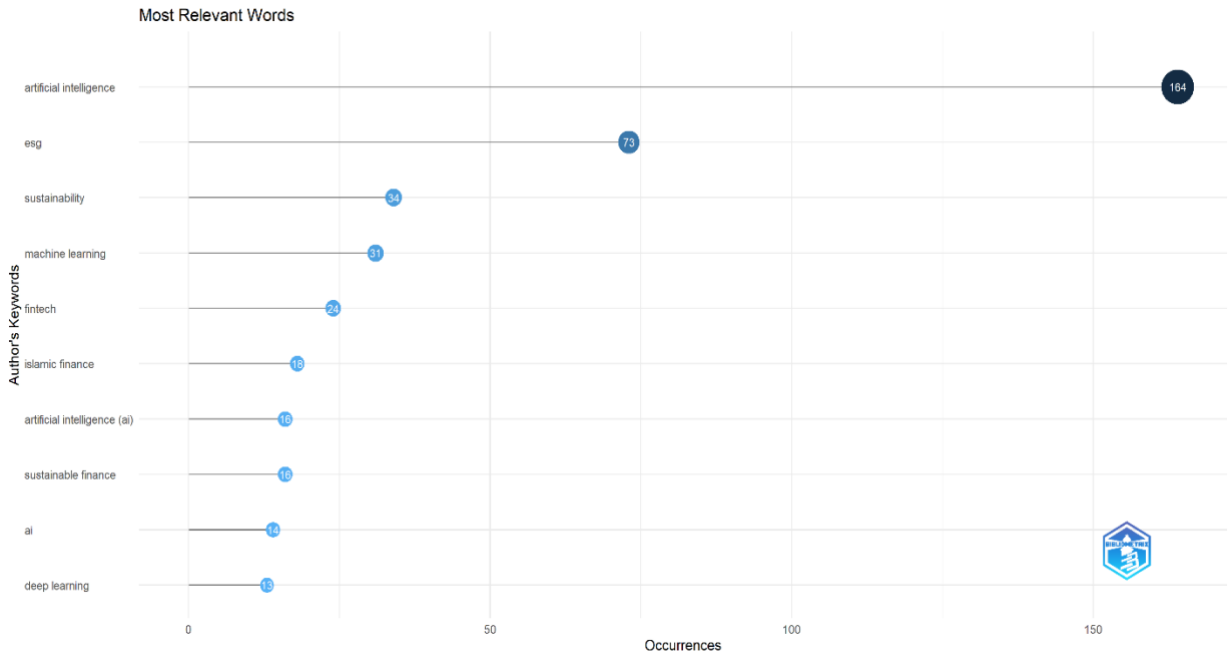
Table 5 highlights the most prominent institutional contributors to this research. The Skolkovo Institute of Science and Technology in Russia leads the list with 8 publications, indicating its active engagement in interdisciplinary research. It is followed by the Department of

Architectural Engineering in the UAE and the Department of Informatics in Indonesia, contributing 5 and 4 articles, respectively. Several other institutions-including the University of New Orleans, MGIMO University, and Kingdom University-have each produced 4 publications, demonstrating notable academic involvement across diverse geographical regions such as the United States, Russia, and Bahrain. This distribution reflects a growing international interest in the convergence of sustainability, ethical finance, and emerging technologies.

4.5 Thematical Analysis

Thematical analysis offers a deeper understanding of the intellectual structure and evolving focus. By identifying key research themes, conceptual clusters, and their temporal evolution, this section aims to uncover dominant topics, emerging trends, and potential gaps in the literature. Such insights are essential for mapping the trajectory of scholarly discourse and guiding future research agendas in this interdisciplinary domain.

Figure VI: Most frequent word.

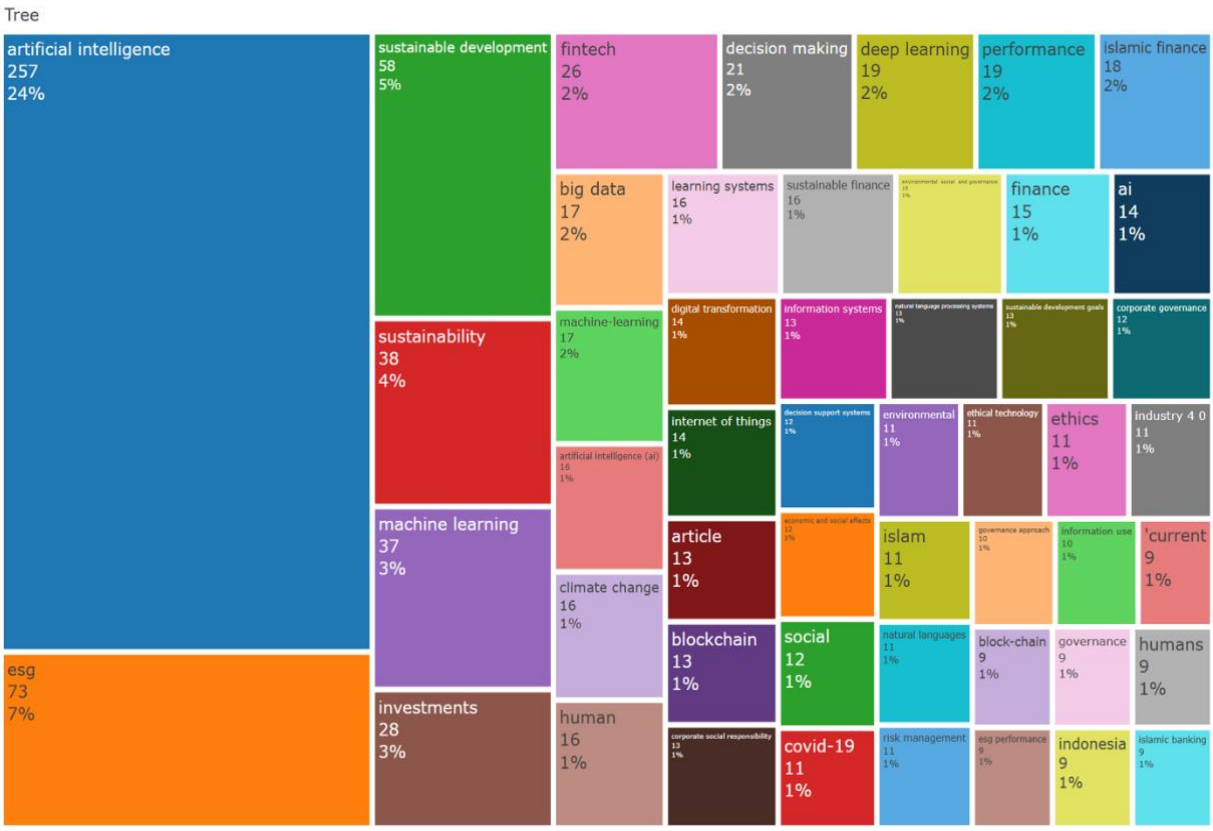


Source: Authors.

Figure 6 displays the most frequently occurring author keywords within the dataset, reflecting the conceptual core of the intersection between artificial intelligence, ESG, and Islamic finance. The term “artificial intelligence” is by far the most dominant, appearing 164 times, highlighting

its centrality in current academic discourse. “ESG” follows with 73 mentions, underscoring the growing relevance of environmental, social, and governance factors in technological and financial research. Other notable terms such as “sustainability,” “machine learning,” and “fintech” indicate a focus on innovation-driven sustainable solutions. Meanwhile, “Islamic finance,” “sustainable finance,” and “deep learning” reflect niche but increasingly significant areas of exploration. Collectively, these keywords illustrate the interdisciplinary nature of the field, where technological tools are being leveraged to support ethical finance and sustainable development.

Figure VII: Word tree map.

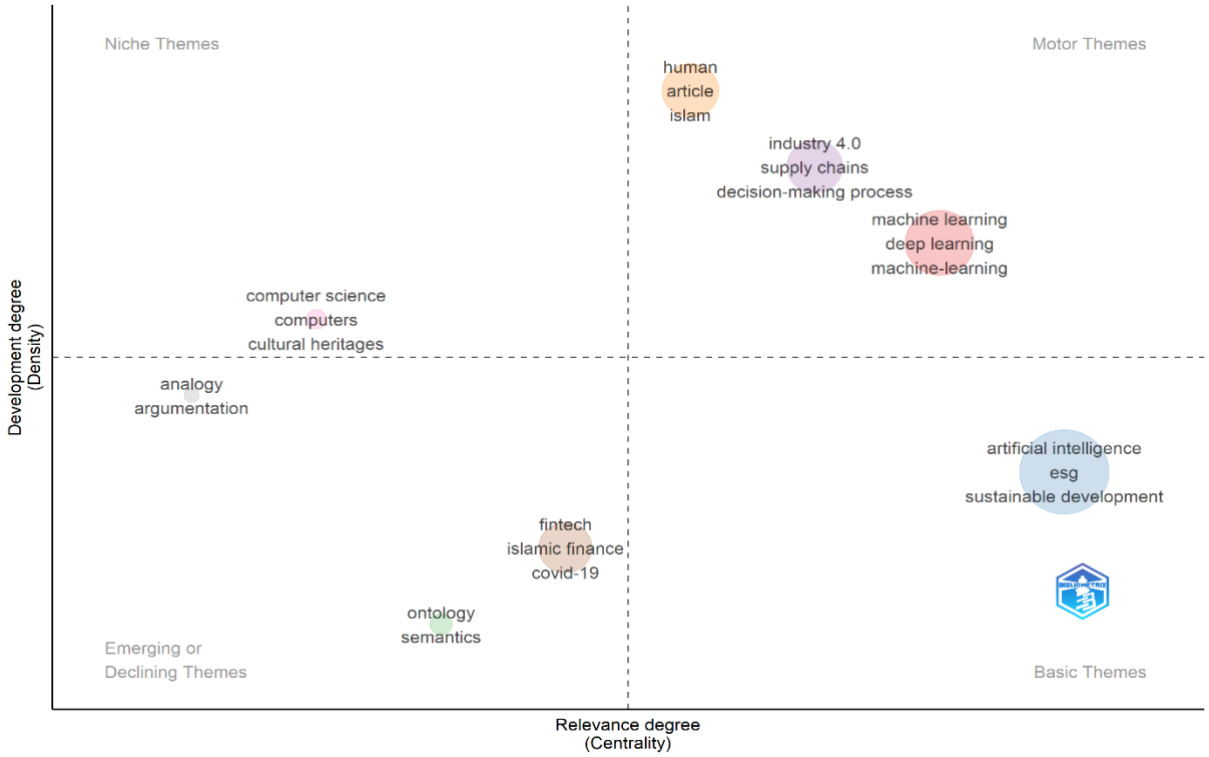


Source: Authors.

Figure 7 provides a hierarchical visualization of the most frequently addressed research topics within the dataset, highlighting their relative contribution to the overall scholarly discourse. The most dominant theme is "artificial intelligence," which represents 24% of the research focus, confirming its central role in shaping current academic explorations. This is followed by "ESG" at 7% and "sustainable development" at 5%, emphasizing the growing integration of ethical and environmental dimensions in technology-driven studies.

Other key topics include "sustainability" (4%) and "machine learning" (3%), which reflect continued interest in data-driven approaches to sustainable innovation. Additional themes such as "investments," "fintech," and "decision making" each account for 2–3%, signaling a strong financial and operational orientation. Subthemes like "Islamic finance," "sustainable finance," "blockchain," "ethics," and "climate change," each appearing at around 1%, suggest an expanding interdisciplinary dialogue involving finance, governance, and responsible innovation. Overall, the figure illustrates the breadth and depth of the field, with both dominant and emerging areas contributing to a dynamic research ecosystem.

Figure VIII: Thematic map.



Source: Authors.

Figure 8 presents a thematic map that categorizes research themes based on their centrality (relevance degree) and density (development degree) within the field.

The bottom-right quadrant highlights "artificial intelligence," "ESG," and "sustainable development" as basic themes—widely connected and foundational to current scholarship in the intersection of AI, ethics, and sustainability. Their high centrality suggests that they serve as anchoring concepts in this research.

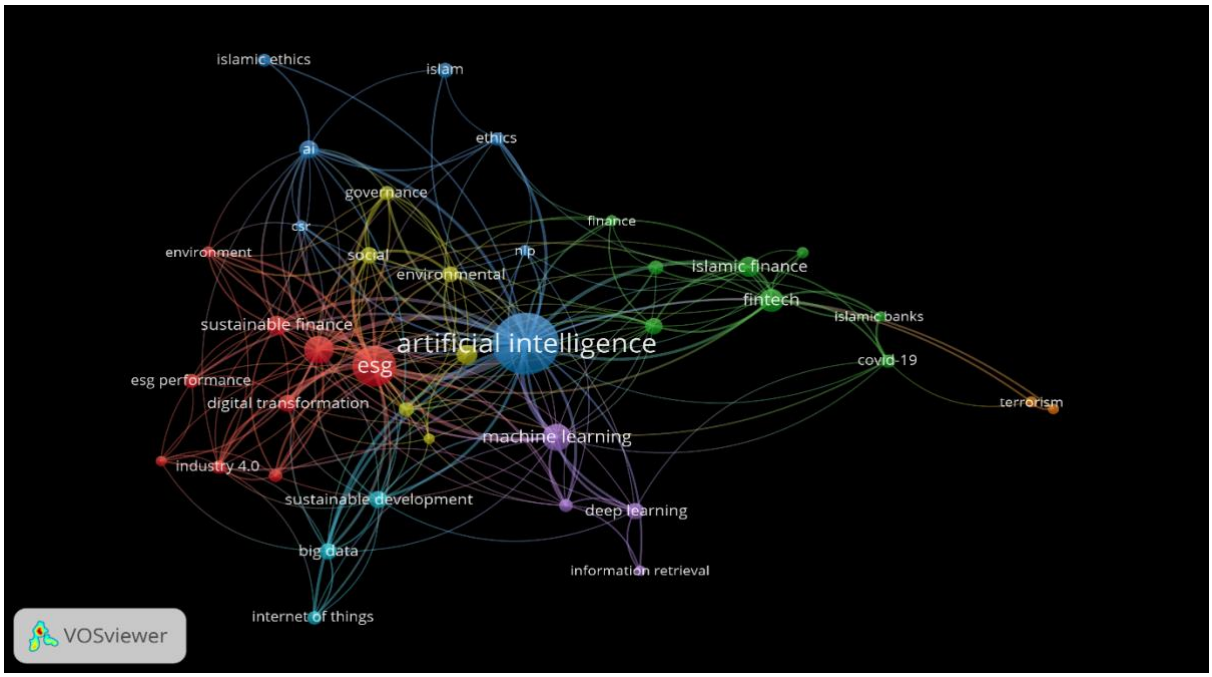
In the upper-right quadrant, which represents "motor themes" that are both well-developed and highly relevant, we find clusters such as "machine learning," "deep learning," "industry 4.0," and "decision-making process." These reflect dynamic, cutting-edge areas that are actively shaping the field's direction. Meanwhile, the lower-left quadrant includes themes like "ontology," "semantics," and "COVID-19," which are classified as "emerging or declining," indicating either nascent interest or a fading research focus.

Finally, the upper-left quadrant contains niche themes such as "computers" and "cultural heritages," which exhibit high specialization but low linkage with broader discussions. This visual reinforces the centrality of AI and ESG in driving contemporary discourse, while also pointing to auxiliary areas with potential for further integration or exploration.

4.6 Co-occurrence and bibliometric coupling

This section explores the intellectual structure of the research field through co-occurrence and bibliometric coupling analyses. These methods help uncover how key concepts and scholarly works are interconnected, providing insight into thematic linkages, author collaborations, and the clustering of influential contributions. By examining the co-occurrence of keywords and the coupling of documents based on shared references, this section highlights the underlying knowledge networks and emerging patterns shaping the discourse at the intersection of ESG, Islamic finance, and artificial intelligence.

Figure IX: Co-occurrence of keywords network.



Source: Authors.

Figure 9 presents a co-occurrence keyword map generated using VOSviewer, highlighting the conceptual structure of the literature at the intersection of artificial intelligence, ESG, and Islamic finance. At the center of the network, "artificial intelligence" appears as the most prominent term, strongly interconnected with other core concepts such as "ESG," "sustainable finance," and "digital transformation," indicating its centrality in driving innovation and ethical integration. The red cluster emphasizes ESG-related themes, including "sustainable development," "environment," and "performance," reflecting a growing concern for socially responsible AI applications. In parallel, the green cluster is anchored around "Islamic finance" and "fintech," suggesting a dedicated stream of research that explores the compatibility of emerging technologies with Shariah-compliant principles. Technological subfields like "machine learning," "deep learning," and "big data" appear in the purple and light-blue clusters, underscoring their methodological significance across applications. Notably, terms such as "ethics," "governance," and "Islam" are also integrated into the network, pointing to the field's normative and cultural considerations. Overall, this map illustrates the interdisciplinary and multifaceted nature of current research, with AI serving as a nexus linking sustainability imperatives, Islamic financial ethics, and digital innovation.

4.7 Discussions and implications

Over the past two decades, the convergence of Artificial Intelligence (AI), Environmental, Social, and Governance (ESG) principles, and Islamic finance has evolved considerably, driven by global sustainability imperatives, digital innovation, and the increasing need for ethical financial frameworks. Through a bibliometric analysis, this study traced the intellectual trajectory of this emerging intersection, uncovering its key thematic clusters, influential authors, institutional contributors, and evolving scholarly patterns. This section synthesizes the main insights from the bibliometric results, focusing on five core dimensions: the historical development of the research field, its conceptual structure, geographic and institutional distribution, notable contributors, and emerging trends for future inquiry.

4.7.1 Chronological Evolution and Geographical Reach

Academic interest in the intersection of AI, ESG, and Islamic finance has expanded markedly since 2004, with a significant acceleration observed from 2019 onward (Figure 1; Table 1). This surge aligns with the global expansion of ESG disclosure mandates and the wider deployment of AI tools in financial systems, especially in contexts requiring ethical oversight and compliance (Almarri et al., 2023; Khan et al., 2022; Rejeb et al., 2023). The early years of the field were characterized by conceptual and normative discussions, but the past decade has seen a notable increase in empirical and data-driven studies, indicating the field's shift toward operationalization and impact assessment.

Geographically, the research is concentrated in Southeast Asia and the Gulf, with Malaysia, Indonesia, and Saudi Arabia leading publication output (Figure 2). This distribution reflects the institutional embeddedness of Islamic finance in these regions and policy support for sustainability-driven fintech (Irfan et al., 2021; Rabbani & Khan, 2022). Meanwhile, countries such as the United States, United Kingdom, and Switzerland, though contributing fewer publications, show disproportionately high citation averages (Figure 4), indicating that their research is shaping the field's theoretical and methodological directions (Zahan et al., 2022).

4.7.2 Conceptual Architecture and Thematic Dynamics of the Field

The thematic mapping (Figures 6–9) reveals that core terms such as "artificial intelligence," "ESG," and "sustainability" form the intellectual backbone of the field, often appearing together across clusters. Machine learning, big data, and decision-making represent dominant motor themes that operationalize ethical finance through technological means (Ahmad et al., 2023; Chen et al., 2022). These methods support dynamic ESG screening, Shariah compliance evaluation, and real-time sustainability monitoring—functions critical to the integration of Islamic finance within global sustainable finance frameworks.

Simultaneously, keywords such as "Shariah compliance," "Zakat," and "Islamic fintech" appear in smaller but rapidly growing clusters, indicating emerging interest in embedding doctrinal values within AI applications (Rabbani et al., 2020; Hussein et al., 2024). Thematic tree maps and co-word analyses further demonstrate the interdisciplinary nature of the literature, where ethics, religion, finance, and technology converge to build a unique subfield grounded in both normative and computational logics (Farooq & El Gamal, 2021).

4.7.3 Key Contributors and Institutional Research Networks

As shown in Tables 3 and 4, leading scholars such as Mustafa Raza Rabbani, M. Irfan, and M. Khan have significantly shaped the field through both high publication volume and citation impact. Their work spans ethical finance, ESG integration, and algorithmic governance, making them central figures in this interdisciplinary nexus. Their strong fractionalized scores also reflect meaningful collaboration, suggesting that collective research is essential to advancing this complex domain (Khan et al., 2022).

Institutionally, Malaysian and Gulf universities dominate in terms of output, with emerging contributions from European and Russian institutions (Table 5). The internationalization of the field is further evidenced by a 25% rate of multi-country publications (Table 1), reflecting the growing importance of cross-border collaboration in addressing global challenges through ethical and technological lenses (Rejeb et al., 2023).

4.7.4 Theoretical, Practical, and Regulatory Implications

The results yield several implications. Theoretically, they call for a more integrated framework that combines Maqasid al-Shariah with ESG performance indicators and AI ethics principles.

This requires conceptual alignment between Western sustainability metrics and Islamic ethical jurisprudence (Farooq & El Gamal, 2021). On a practical level, the centrality of AI as a keyword suggests urgent opportunities for developing fintech tools that facilitate dual compliance—both Shariah-based and ESG-oriented—such as automated ESG-Shariah filters and ethical credit scoring systems.

Table VI: AI-Enabled Contributions to ESG–Islamic Finance Integration Aligned with Shariah Principles

AI CAPABILITY	APPLICATION AREA	ESG ALIGNMENT	SHARIAH COMPLIANCE RELEVANCE
Machine Learning Algorithms	ESG screening of investment portfolios	Enhances environmental and social impact assessments	Enables automated filtering against haram sectors
Natural Language Processing	Shariah contract validation	Improves transparency in governance documentation	Supports fatwa consistency and Arabic legal text analysis
Big Data Analytics	Zakat and Sadaqah impact tracking	Improves social inclusion and financial access metrics	Ensures traceability and fair redistribution mechanisms
Predictive Modeling	Green sukuk performance forecasting	Promotes long-term sustainability investment	Aids in risk-sharing evaluations for sukuk structures
AI-Based Audit Systems	Compliance monitoring and traceability	Enhances ESG reporting credibility	Ensures ongoing Shariah oversight and auditability
Recommender Systems	Ethical and sustainable product design	Encourages responsible consumer and investor behavior	Personalizes offerings within halal and ethical boundaries

Source: Authors.

This table illustrates how key AI technologies contribute to the convergence of ESG principles and Islamic finance, while adhering to Shariah norms. Each capability aligns with specific ethical and operational goals, supporting both sustainability imperatives and religious compliance frameworks.

For regulators and Shariah boards, the findings underscore the importance of establishing AI governance protocols, ensuring algorithmic transparency, and setting jurisdiction-sensitive ESG standards. Without clear rules on data quality, fairness, and interpretability, AI systems risk misaligning with the doctrinal and ethical expectations of Islamic finance (Ahmad et al., 2023; Rejeb et al., 2023).

4.7.5 Literature Gaps and Future Research Directions

Despite its growth, the field remains fragmented in key areas. Few longitudinal studies assess the financial and social performance of AI-integrated, ESG-compliant Islamic financial products. Algorithmic transparency and the development of explainable AI frameworks compatible with Shariah auditing remain underexplored (Chen et al., 2022; Rabbani & Khan, 2022). Furthermore, disparities in ESG reporting standards across jurisdictions hinder comparative analysis and global policy integration.

Future research should emphasize mixed-method designs combining bibliometric mapping, case studies, and system prototyping. Cross-disciplinary teams involving Islamic scholars, data scientists, and sustainability experts will be essential for producing robust, culturally sensitive, and ethically sound AI-finance systems. Collaborative engagement with financial institutions and regulatory bodies will also be critical to translating theoretical advances into practical tools that support inclusive, transparent, and Shariah-compliant sustainable finance.

In sum, bibliometric evidence reveals a promising yet complex research landscape. AI serves as the enabling infrastructure, ESG provides the ethical compass, and Islamic finance offers doctrinal depth. Together, they define a transformative research frontier with significant implications for theory, policy, and practice.

5. Conclusion

This bibliometric investigation into the convergence of Artificial Intelligence (AI), Environmental, Social, and Governance (ESG) criteria, and Islamic finance highlights the growing academic and practical relevance of this interdisciplinary field. From its conceptual emergence in the early 2000s to its recent expansion into applied research, the integration of ESG values into Islamic financial systems through AI technologies has evolved into a dynamic and strategically important area of study.

The analysis reveals several key themes shaping this scholarly domain: the application of AI for Shariah-compliant ESG screening, the ethical governance of financial innovation, and the development of fintech solutions that align with both sustainability goals and Islamic principles. Research contributions are increasingly global, with strong participation from Southeast Asia, the Gulf region, and emerging collaborations with Western academic institutions. This geographic dispersion reflects both the regional embeddedness of Islamic finance and the universal relevance of ethical finance in a digitized world.

The results also emphasize the importance of collaborative research networks in advancing the field—particularly interdisciplinary partnerships between scholars in finance, technology, jurisprudence, and sustainability science. Emerging trends suggest a shift toward the operational integration of AI in Islamic financial products, the digital transformation of Shariah auditing processes, and the design of dual-compliant financial tools that meet ESG standards while honoring religious values.

Looking ahead, future research will need to engage more deeply with challenges related to algorithmic transparency, the standardization of ESG metrics in Islamic contexts, and the social performance measurement of AI-enabled financial instruments. As global finance seeks to become more inclusive, accountable, and ethically grounded, the strategic alignment of AI, ESG, and Islamic finance represents not only a technological shift but a redefinition of financial responsibility in the 21st century.

References

Ardia, D., Bluteau, K., & Boudt, K. (2022). Carbon risk and green finance: Evidence from dynamic portfolio strategies. Journal of Financial Markets, 59, 100643.

Chen, H., & Ma, X. (2024). Regulating carbon finance in developing countries: Policy frameworks and market dynamics. Environmental Policy and Law, 54(2), 201–216.

Dahlen, M., Kronlid, D., & Nyberg, D. (2024). Carbon finance and the sustainability dilemma: Exploring market-based climate solutions. Journal of Business Ethics, 187(4), 813–828.

Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. Journal of Business Research, 133, 285–296.

Johnson, M., & Schaltegger, S. (2020). Sustainability integration and institutional change: The case of carbon finance. Accounting, Auditing & Accountability Journal, 33(6), 1289–1317.

Jürgens, R., Baden-Fuller, C., & Volberda, H. W. (2006). Carbon markets and organizational adaptation: Insights from the EU Emissions Trading Scheme. Organization Studies, 27(5), 775–796.

Keathley-Herring, H., Ghosh, S., & Huff, J. (2016). A bibliometric analysis of Six Sigma research from 1997 to 2014. Total Quality Management & Business Excellence, 27(3–4), 402–439.

Lawani, S. M. (1981). Citation analysis and the quality of doctoral research: A study of dissertations in the field of education. Journal of Information Science, 3(4), 177–183.

Meng, X., Zhang, L., & Wang, Y. (2023). The financialization of carbon credits and their role in corporate ESG strategies. Journal of Sustainable Finance & Investment, 13(1), 55–72.

Mishra, D., Gunasekaran, A., Papadopoulos, T., & Dubey, R. (2017). Bibliometric analysis of supply chain risk management: State-of-the-art research and future directions. Omega, 66, 258–272.

Pritchard, A. (1969). Statistical bibliography or bibliometrics? Journal of Documentation, 25(4), 348–349.

Salinas-Ríos, T., & López, M. (2022). Exploring carbon finance research through bibliometric mapping: Trends and thematic evolution. Environmental Economics and Policy Studies, 24(2), 321–339.

Sivertsen, G., Larsen, B., & Schneider, J. W. (2019). Measuring the fractional contribution of co-authors in bibliometric indices. Journal of Informetrics, 13(2), 608–621.

Tao, Q. (2024). Reimagining carbon finance in the age of climate justice. Ecological Economics, 215, 107955.

Tariq, K., & Hassan, M. K. (2023). Islamic green finance: Opportunities and regulatory challenges. Global Finance Journal, 58, 100812.

Vindrola-Padros, C., & Johnson, G. A. (2020). Rapid techniques in qualitative research: A critical review of the literature. Qualitative Health Research, 30(10), 1596–1604.

Weismayer, C., & Pezenka, I. (2017). A bibliometric analysis of peer-reviewed publications on sustainable development in higher education. Journal of Cleaner Production, 165, 102–111.

Wu, J., & Niu, D. (2024). Carbon emissions trading and firm-level innovation: Evidence from Chinese pilot markets. Energy Economics, 121, 106657.