

From Traditional to Sustainable and Green Finance – A Bibliometric and Comparative Approach

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This study explores the intellectual evolution from traditional finance to sustainable and green finance through a bibliometric and comparative analysis. It is based on peer-reviewed articles indexed in Web of Science Core Collection published in English between 1990 and 2026. Through this approach, the paper maps the development of sustainable and green finance research, highlighting key thematic clusters and identifying areas where traditional and sustainable and green finance converge. The findings reveal a complex but fragmented scientific landscape. Traditional finance remains highly concentrated around a small set of core journals and authors, reflecting its maturity and theoretical consolidation. In contrast, sustainable finance shows moderate concentration, while green finance is more dispersed, highlighting its interdisciplinary and evolving nature. Keyword co-occurrence and temporal analyses indicate a significant rise in sustainability and green topics, especially after 2015, driven by increasing global attention to environmental and social challenges. Despite their shared relevance, the interaction between these three streams remains limited. Each based on its own theoretical fundamentals, applies distinct methodological tools and responds to different policy and regulatory environments.

Keywords: sustainable finance, green finance, traditional finance, bibliometric analysis

JEL Classification: C55, G10, Q56

1. Introduction

The global financial system is undergoing a deep transformation, driven by the urgency of climate change, increasing awareness of social inequalities and the limitations of profit-oriented capital allocation. As a result, finance is no longer defined by a single dominant paradigm. Alongside traditional finance, two additional streams - sustainable finance and green finance - have gained significance.

The rapid growth of research in sustainable and green finance in recent years underscores the need for a structured and quantitative evaluation of the literature for a clearer understanding of the field, its main

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research themes and networks. This study addresses this gap through a comparative analysis that combines bibliometric methods with content analysis, focusing on peer-reviewed articles published in English between 1990 and 2026, extracted from Web of Science Core Collection.

The paper aims specific objectives:

- to construct a comparative matrix traditional - sustainable - green finance that places these streams in direct analytical relation, highlighting similarities and key differences;
- to identify the main research themes and clusters within each stream;
- to map the bibliometric profile of each stream, including publication trends, sources, authors, documents, citation patterns and scientific development, using data from Web of Science Core Collection analyzed with VOSviewer and Bibliometrix.

The remainder of the paper is structured as follows: Section 2 reviews the relevant literature, Section 3 outlines the research methodology, Section 4 presents the analysis and results and Section 5 provides the discussion and concluding remarks.

2. How sustainable and green finance diverge from traditional finance in literature

Sustainable finance is a term that describes the use of financial tools and strategies to achieve environmental and social goals. According to (EuropeanCommission), sustainable finance “refers to the process of taking environmental, social and governance (ESG) considerations into account when making investment decisions in the financial sector, leading to more long-term investments in sustainable economic activities and projects”.

Green finance is defined by World Economic Forum (WEF, 2020) as “any structured financial activity – a product or service – that's been created to ensure a better environmental outcome”.

Considering the literature, it is important to distinguish between sustainable finance and green finance, but also to compare them with traditional finance, to clarify concepts and delimit the theoretical framework.

A major review paper (Cunha, Meira, & Orsato, 2021) stresses that sustainable finance and investment emerged to challenge the traditional short-term nature of financial logic, which prioritizes immediate returns over long-term environmental and social outcomes. Another review of the literature (Ozili, 2022) finds that green and sustainable finance attempt to correct market failures in traditional finance by pricing in environmental externalities and climate risk through dedicated instruments, disclosure rules, and taxonomies. Using a bibliometric analysis, (Krastev & Krasteva-Hristova, 2024) show that traditional finance practices still dominate global capital allocation and green/sustainable segments remain small and constrained by data gaps, regulation and greenwashing risks.

Many authors frame green finance as the future direction of finance, in which traditional tools are redesigned with sustainability conditions rather than replaced outright (Bhattacharyya, 2021). Evidence suggests green instruments can offer competitive returns while improving risk resilience, contrasting with the view in traditional finance that sustainability necessarily implies lower returns (Radhakrishnan, Deepa, Lonare, & Das, 2025).

A comparison between traditional finance and green finance and sustainable finance is detailed in Table 1.

Table 1. *Traditional - green - sustainable finance – a comparative matrix*

Dimension	Traditional finance	Green finance	Sustainable finance
Primary objective	Maximize risk-adjusted financial returns	Finance environmentally beneficial projects	Align finance with ESG and SDGs
Treatment of ESG	As risk or compliance issue	Environment is core objective; social often secondary	ESG central to investment thesis and risk management
Typical instruments	Conventional equities, bonds, loans, derivatives	Green bonds, green loans, climate/carbon funds, green credit	ESG funds, sustainability-linked loans/bonds, impact funds
Project scope	All sectors; no requirement of sustainability benefit	Green sectors: renewables, energy efficiency, pollution control, circular economy	Broad: environment, labor, human rights, governance
Time horizon	Short-term, quarterly performance logic	Medium-long term project horizons	Long-term value, resilience to climate and social risks

Main actors	Commercial banks, asset managers, corporates using standard metrics	Same actors using green instruments, plus climate funds	Asset owners, ESG funds, development banks, regulators
Role in transition	Can fund high-carbon and low-carbon assets based on returns	Redirects capital specifically to low-carbon and eco-efficient assets	Seeks reorientation of capital toward sustainable development

Source: authors' contribution

The main differences are in their logic and objectives:

- traditional finance centers based on risk-return optimization and shareholder value, generally treating environmental and social issues only as they affect financial performance (e.g., regulatory risk, reputational risk) (Cunha et al., 2021);
- sustainable finance incorporates ESG (environmental, social, governance) factors into risk management, offering a broader perspective on risk assessment compared to traditional finance, which often considers financial metrics alone (Krastev & Krasteva-Hristova, 2024);(Arhinful, Mensah, Amin, Obeng, & Gyamfi, 2025);
- green finance is more focused on environmental outcomes (climate, pollution, resource efficiency), using specific instruments such as green bonds, green loans and climate funds (Ozili, 2022);
- green finance utilizes metrics like carbon footprint reduction and resource efficiency, contrasting with traditional financial metrics such as return on investment and net present value (Jamali & Voghouei, 2025);
- green and sustainable finance prioritize environmental and social objectives alongside financial returns, while traditional finance strategies are often driven by shareholder value maximization (Asif, Naz, & Ijaz, 2025); (Erdoğdu, Dayi, Özbek, Ganji, & Benek, 2025); (Qi, Jia, Zhou, & Zhang, 2026).
- the integration of technologies such as blockchain in green finance enhances transparency and efficiency, which is less prevalent in traditional finance (Hidayat-ur-Rehman & Hossain, 2024).

3. Research methodology

This paper explores the evolving relationship between traditional financial models and the emerging sustainable and green finance paradigms. The analysis is based on peer-reviewed literature published in English from 1990 to 2026. A structured search strategy by topic has been used in the Web of Science Core Collection to identify relevant studies. The search query combined the terms “Green Finance” OR “Sustainable Finance” with “Traditional Finance” OR “Mainstream Finance”. The first search resulted in 5550 documents in English. In order to ensure the consistency of the analysis and the academic quality, the dataset was refined to include only journal articles, resulting in a final sample of 4176 articles.

First, we used VOSviewer software (van Eck & Waltman, 2014) to create a keyword co-occurrence network and map based on bibliographic data (4176 articles, 9982 keywords from which 942 meet the threshold of minimum 5 occurrences of a keyword).

To visualize how green, sustainable and traditional finance interact we made in the second stage a bibliometric analysis using Bibliometrix/Biblioshiny software from R-tool (Aria & Cuccurullo, 2017).

Through this approach, the study maps the development of sustainable and green finance research, highlighting key thematic clusters and identifying areas where traditional and sustainable finance converge or diverge.

4. Analysis and Results

4.1. Conceptual structure

The bibliometric mapping reveals three distinct overlapping scientific domains that define the current state of research. Figure 1 shows a keyword co-occurrence network map generated by VOSviewer, providing a visual landscape of the study dataset.

4.2. Scientific production evolution

The collection used in bibliometric analysis is large enough to reveal important trends and patterns: 4176 articles in English for the period 1990-2026; 803 unique sources; 8700 unique authors; 525 single-authored documents (12%), that underlines the prevalence of collaborative work; international co-authorships 31.07%, that marks an impactful and globally relevant research. The annual growth rate of scientific production is 19.56%, attracting new research output especially after 2016 (Figure 2).

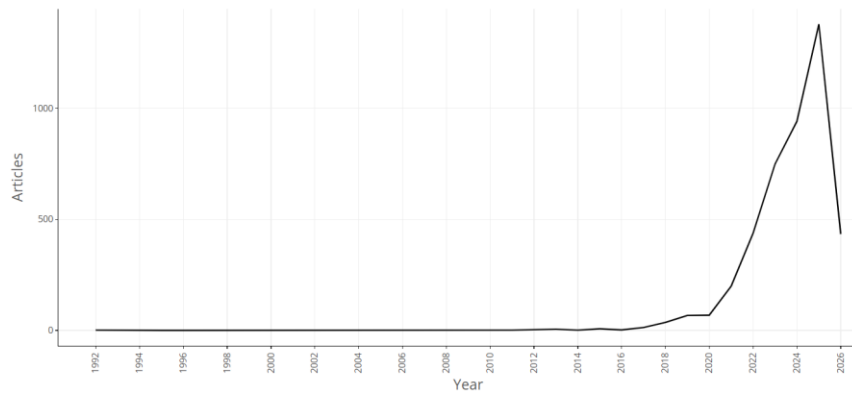


Figure 2. Annual scientific production
Source: created by authors using Biblioshiny

Figure 3 illustrates the temporal evolution of keyword frequency, highlighting how the focus of the literature has evolved. By tracking the occurrence of keywords in selected period (1990-2026), the figure provides insight into the emergence, growth and consolidation of dominant themes in the field. In the earlier years, the frequency of terms related to sustainable and green finance remains relatively low, followed by a sharp acceleration in recent years. Among the terms, “green finance” has the most visible growth, with an upward trajectory starting in 2020. In contrast, more traditional terms like “economic growth” and “performance” shows more constant increases, suggesting their continued relevance but comparatively slower transformation.

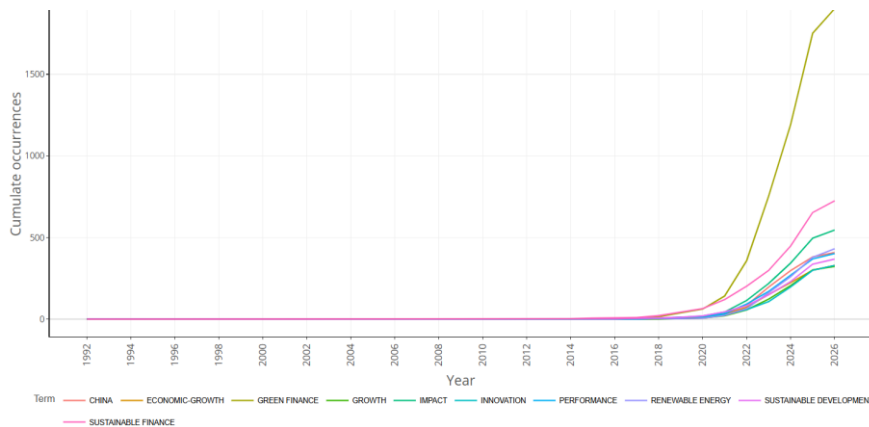


Figure 3. Keywords' frequency over time
Source: created by authors using Biblioshiny

Overall, the figure captures not only the expansion of the field but also the shifting emphasis of research, illustrating how sustainability-related concepts have moved from the periphery toward the center of financial research, particularly in the past decade.

Figure 4 shows the evolution of top research topics from 2016 to 2026, pointing the terms with the highest annual median frequency on three periods:

1. Early and foundational topics (2018-2022):

The earliest terms like “global governance” (2018), “divestment”, “project finance”, “accountability”, “agent-based modeling” and “protected areas” (2019-2020) appear with relatively smaller bubble sizes, indicating lower overall frequency. “Paris Agreement” arises in 2019 and continues, signifying the enduring

relevance of international climate policy. Terms such as “conservation”, “opportunities”, “payments”, “trade”, “credit”, “management” and “impact” emerge around 2020-2022, suggesting initial explorations into economic, managerial and environmental implications, though at moderate frequencies. The longer blue line for terms like “protected areas” indicates a higher variability in its frequency across the papers published in this period, even if it was among the top 3.

2. Rapid emergence and dominance of green and sustainable finance (2023-2024):

The most important trend is the rise of “green finance” and “sustainable finance” in 2023-2024. These terms have the largest bubble sizes (exceeding 1500 in frequency for “sustainable finance” in 2024), indicating a growth in research attention and becoming the most dominant keyword in recent years. This highlights a clear shift towards integrating environmental and social aspects into financial systems.

3. Extending the scope to climate risks and energy transition (2024-2026):

Following closely behind finance, terms like “climate risks”, “carbon performance”, “energy transition”, “stock market” and “time-series” become highly prominent in 2024-2025. This indicates that research is not only focusing on the financial instruments (“green/sustainable finance”) but also on the impact of climate change on financial markets (“climate risks”, “stock market”), the measurement of environmental performance (“carbon performance”) and the systemic shifts required (“energy transition”).

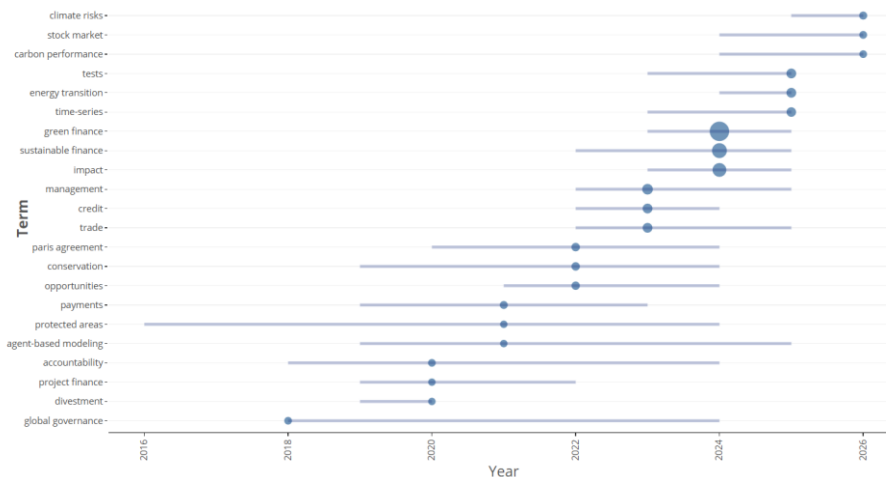


Figure 4. Trend topics

Source: created by authors using Biblioshiny

Thus, a clear and accelerating shift in research is observed from fundamental policy and specific management aspects towards a strong interdisciplinary focus on sustainable and green finance, driven by concerns about climate risks, carbon performance and energy transition.

4.3. Sources analysis

The most important sources are illustrated in Figure 5.

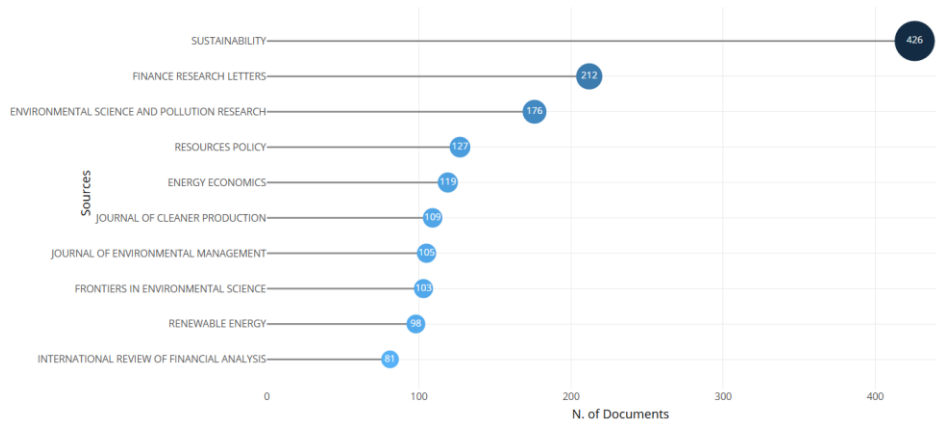


Figure 5. Most relevant sources
Source: created by authors using Biblioshiny

Applying Bradford’s law separately to each research stream reveals notable differences in how knowledge is distributed across sources. Traditional finance is the most concentrated field. A small core of leading journals - Journal of Finance, Journal of Financial Economics, Review of Financial Studies and Journal of Financial and Quantitative Analysis - accounts for a disproportionate share of the literature, consistent with a mature field. Sustainable finance is moderately concentrated around Sustainability, Business Strategy and the Environment and Corporate Social Responsibility and Environmental Management. Green finance appears as the most dispersed stream. Although journals like Journal of Cleaner Production, Energy Economics and Finance Research Letters can be seen as forming a relatively soft core, a substantial share of the literature is spread across environmental science, energy policy and regional journals. This dispersion reflects the interdisciplinary and evolving nature of green finance, where research is not yet consolidated within a clearly defined set of dominant journals.

4.4. Authors analysis - productivity and dominance

The most productive authors analysis confirms that the three streams have developed around distinct scientific communities. In traditional finance, the highest h-index authors are key figures whose influence results from citations rather than output, as their fundamental works were published decades ago.

Figure 6 visualizes the research trajectory of leading authors and the impact of their work, focusing on the period 2018-2026, when it is observed a significant growth in research on green finance and sustainability topics. Authors such as Wang Y. (37 articles), Taghizadeh-Hesary F. (36 articles), Lee C.C. (35 articles) and Zhang Y. (35 articles) have sustained productivity over a longer period, indicating continued engagement and a strong presence of East Asian scholars in this research domain. For example, Wang Y. demonstrates a consistent focus on green finance policies and their environmental and economic effects, particularly in China, with a highly cited work (Zhang, Wu, Wang, & Hao, 2021). Several other contributors - including Liu Y. (29 articles), Li Y. (22 articles) and Zhao X. (20 articles) - show moderate levels of output and a research development in recent years.

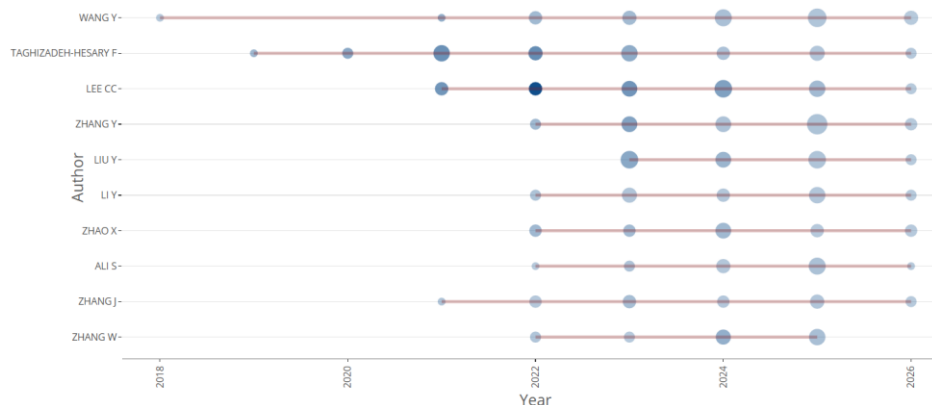


Figure 6. Authors' production over time

Source: created by authors using Biblioshiny

Overall, the results point to a core group of highly productive and influential researchers who play a key role in shaping the development of sustainable and green finance literature.

4.5. Documents analysis - most cited papers

In traditional finance, the top cited documents are methodological or theoretical fundamentals that have accumulated citations over fifty years. In sustainable finance, the most cited papers are meta-analyses and empirical aggregations - particularly (Friede, Busch, & Bassen, 2015) - which investigate the relation between environmental, social and governance criteria and corporate financial performance. In green finance, the most cited papers are recent empirical studies of green bond pricing and issuance effects (Flammer, 2021);(Lee & Lee, 2022); (Yu, Wu, Zhang, Chen, & Zhao, 2021); (Tang & Zhang, 2020), indicating a field still in its hypothesis testing phase (Figure 7).

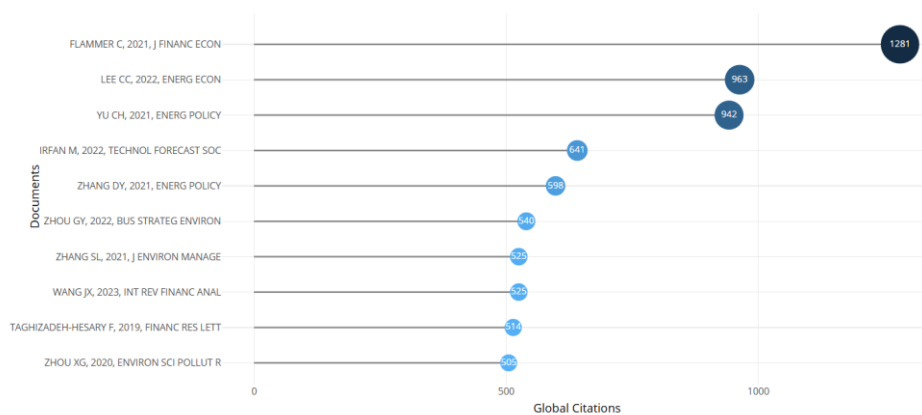


Figure 7. Most global cited documents

Source: created by authors using Biblioshiny

4.6. Network structure and interconnections

A powerful tool to understand the research landscape, identifying key players, major thematic areas and sources is Three-Field Plot. We considered the central field, AU (Authors), acts as the bridge connecting SO (Sources) on the left with DE (Keywords) on the right. The thickness of the ribbons indicates the frequency of co-occurrence, signifying stronger connections.

In Figure 8, Keywords field reveals the core intellectual goal of the research: green finance is the most central and frequently keyword, followed closely by China and sustainable development. Authors field highlights several highly productive authors, with Lee C.C., Taghizadeh-Hesary F. and Zhang Y. appearing as particularly central, given the breadth and thickness of their connecting ribbons. Sources field marks three journals with the strongest links to authors: Energy Economics, Finance Research Letters and Sustainability.

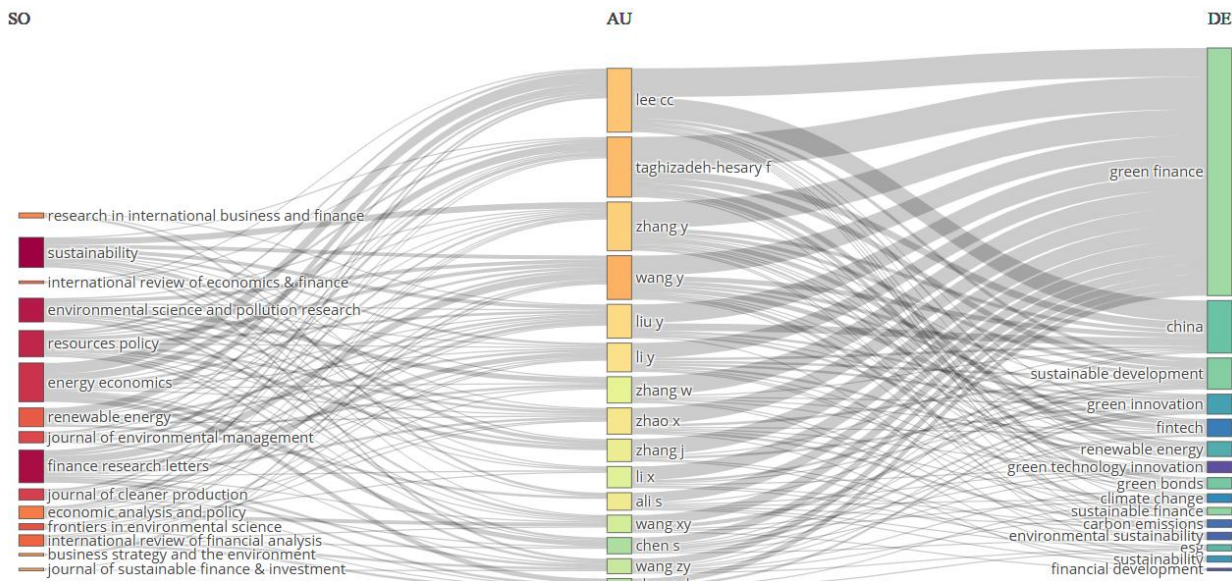


Figure 8. Three-Field Plot
Source: created by authors using Biblioshiny

In conclusion, this Three-Field Plot offers a clear snapshot of a dynamic and interconnected research field, where a group of authors are publishing on green finance and sustainable development across a diverse, interdisciplinary range of environmental, economic and financial journals.

5. Discussion and Conclusion

Traditional, sustainable and green finance are not three points on a single evolutionary line. They share a lot in terms of research methodology, but are based on irreconcilable normative foundations.

The comparison between traditional finance and sustainable and green finance reveals significant differences in objectives, risk management and performance metrics. While sustainable and green finance offer pathways to incorporate environmental and social factors, traditional finance remains focused on financial returns. Traditional finance concentrates on short term profit maximization with little attention for externalities, sustainable finance integrates ESG goals in all activities and green finance targets environmental outcomes through specific instruments. While evidence shows that sustainable/green approaches can match or exceed traditional performance especially on long term – their expansion requires clearer definitions, disclosure standards, stronger regulation against greenwashing and tailored strategies for emerging markets.

Analyzing the literature, we found the following gaps which can be starting points for future research: a lack of comprehensive studies comparing the long term impact of green, sustainable and traditional finance on economic growth; absence of standardized metrics for measuring the success of sustainable and green finance initiatives that limits comparability with traditional finance; differential impact of financial policies on green, sustainable and traditional finance requires further exploration, particularly in diverse regulatory environments (Qi et al., 2026); more research is needed on how investor behavior varies across these financial paradigms, particularly in response to ESG factors.

The bibliometric and comparative analysis summarizes the evolution of the research for the period 1990-2026 and identifies hot topics, influential authors and journals. The three streams differ fundamentally in size, maturity and citation intensity. Traditional finance presents the largest and oldest corpus, with output from 1970, a high average citation per document reflecting decades of accumulation and a low annual growth rate consistent with a mature field. Sustainable finance shows moderate corpus size, rapid post-2015 acceleration and rising average citation per document. Green finance is the smallest but growing corpus, with the fastest annual growth rate and a lower average citation per document reflecting the recency of the literature.

These three approaches coexist within a complex but fragmented scientific landscape. Each based on its own theoretical fundamentals, applies distinct methodological tools and responds to different policy and regulatory environments. Although they all address closely related challenges, the interaction between them

remains relatively limited. Academic research tends to develop in parallel streams: researchers often publish in specialized journals, rely on distinct parts of literature and address to different audiences. This fragmentation has important consequences. For example, advances in climate risk measurement developed within green finance are very slowly integrated into traditional financial models, while insights from ESG integration in sustainable finance are not aligned with the environmental impact metrics from green finance.

The study is subject to certain limitations, especially regarding data selection. It relies exclusively on articles indexed in Web of Science Core Collection. Restricting the dataset to a single source may result in the exclusion of relevant publications indexed in other databases such as Scopus or Science Direct.

In conclusion, traditional, sustainable and green finance are converging at the thematic border - particularly around climate risk, green bond pricing and ESG disclosure - but remain separated at the level of scientific production structure, journal communities and authorship networks.

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