

BIODIVERSITY DISCLOSURE IN FINANCIAL ACCOUNTING: A BIBLIOMETRIC OVERVIEW

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ABSTRAK

Studi ini dilakukan karena masih terbatasnya kajian komprehensif terkait pengungkapan keanekaragaman hayati dalam akuntansi keuangan, meskipun isu ini semakin relevan bagi keberlanjutan dan keputusan investor. Penelitian ini bertujuan mengidentifikasi tren, kontribusi, dan kesenjangan literatur biodiversity disclosure. Kebaruan studi ini terletak pada integrasi analisis bibliometrik dengan identifikasi kesenjangan konseptual dan geografis. Metode yang digunakan adalah analisis bibliometrik berbasis data Scopus 2011–2025 dengan R Studio (Biblioshiny). Hasil menunjukkan peningkatan publikasi setelah 2020 serta dominasi negara maju, sementara negara berkembang seperti Indonesia masih terbatas. Studi ini berkontribusi dengan mengidentifikasi arah penelitian masa depan, termasuk pengembangan model akuntansi keanekaragaman hayati yang terstandarisasi dan terintegrasi, serta merekomendasikan penguatan standar pengungkapan dalam praktik pelaporan perusahaan.

Kata Kunci: Pengungkapan keanekaragaman hayati, akuntansi keuangan, analisis bibliometrik, pelaporan keberlanjutan, transparansi perusahaan

ABSTRACT

This study was conducted due to the limited number of comprehensive studies on biodiversity disclosure in financial accounting. In fact, this issue is becoming increasingly relevant to sustainability and investor decision-making. This research aims to identify trends, contributions, and gaps in the literature on biodiversity disclosure. The novelty of this study lies in the integration of bibliometric analysis with the identification of conceptual and geographical gaps. The method used a bibliometric analysis of relevant studies indexed in the Scopus database from 2011 to 2025. The analysis was facilitated by RStudio (Biblioshiny). The results indicated an increase in publications after 2020 and a dominance of developed nations, whilst developing countries such as Indonesia remain under-represented. This study contributes by identifying directions for future research, including the development of standardised and integrated biodiversity accounting models, and recommends strengthening disclosure standards in corporate reporting practices.

Keywords: Biodiversity disclosure, financial accounting, bibliometric analysis, sustainability reporting, corporate transparency

1. Introduction

Biodiversity supports more than 50% of the world's Gross Domestic Product (GDP), estimated at \$44 trillion, through its contribution to ecosystems and natural services that underpin various economic sectors (Liang et al., 2024). However, human activities have increased biodiversity degradation, driving the need for transparency in reporting corporate impacts on nature. Biodiversity disclosure is then introduced and has increasingly become a major focus in financial accounting, especially following global recognition of its importance for economic and social sustainability. To address this issue, the UN Conference on Biodiversity produced the *Kunming-Montreal Global Biodiversity Framework* that set out Target 15. This framework requires large companies and financial institutions to transparently disclose their risks, impacts, and dependencies on biodiversity (Elsayed, 2023). It is designed to minimize harmful effects on biodiversity while enhancing positive outcomes through more effective capital allocation and improved management of nature-related risks.

Other frameworks, such as the *Taskforce on Nature-related Financial Disclosures* (TNFD), have been developed to help companies integrate nature-related risks and opportunities into their financial decision-making. The TNFD emphasizes that nature-related risks are often invisible on a company's balance sheet because the costs of environmental degradation are often shifted to communities or third parties (Bassen et al., 2024). With this framework, companies are expected to better identify and manage their impacts on biodiversity. In the European Union, the *Corporate Sustainability Reporting Directive* (CSRD) also comes into force in 2025. This regulation requires large companies to report on their strategies in support of the global biodiversity framework and to disclose significant impacts on nature in their sustainability reports (Xu et al., 2021). This reporting standard also includes elements of the TNFD recommendations to ensure global consistency in nature-related reporting.

However, the implementation of biodiversity disclosure remains challenging. Many companies do not have the internal capacity or access to credible data required to assess and report their impacts on nature. Approaches such as natural capital accounting (NCA) offer potential solutions by enabling companies to quantify both physical and monetary aspects of natural capital and ecosystem services relevant to their operations (Xi, 2024). Despite these developments, the limited understanding and inconsistent application of biodiversity disclosure practices continue to hinder effective decision-making, policy formulation, and corporate accountability. Therefore, it is important to conduct further research to provide a more comprehensive and structured understanding of biodiversity disclosure.

Unfortunately, there is a lack of comprehensive studies that systematically map the evolution, structure, and research trends of biodiversity disclosure using quantitative approaches such as bibliometric analysis. Most prior studies focus on specific cases, regions, or theoretical perspectives, without providing an integrated overview of the field. This indicates a clear gap in understanding the overall development and intellectual structure of biodiversity disclosure research.

This review aims to systematically review the existing literature on biodiversity disclosure within the fields of business, management, accounting, and finance. Drawing on

publications indexed in the Scopus database up to January 2025, this review includes both accounting and non-accounting journals that address biodiversity disclosure. Using bibliometric analysis tools such as RStudio (Biblioshiny), this study examines publication trends, influential contributions, and emerging research themes. Furthermore, it identifies conceptual and geographical gaps in the literature and proposes directions for future research. By integrating bibliometric analysis with a structured gap analysis, this study contributes to advancing the literature on environmental disclosure, particularly biodiversity disclosure, and provides a foundation for future academic inquiry.

Building on these contributions, the following research questions are formulated to guide the analysis:

RQ1. What are the current publication trends in biodiversity disclosure in terms of time, journal, author, and country of affiliation?

RQ2. What are the influential studies and research themes in this domain?

RQ3. What are the gaps and areas for future research?

This study contributes to the biodiversity disclosure literature in several ways. First, it provides an up-to-date bibliometric analysis that captures the evolution of research issues in this field. Second, it bridges gaps in previous studies, especially regarding topic coverage, year, source, and specific analysis. Third, it identifies the drivers of the development of biodiversity disclosure studies. Then, the study identifies conceptual and geographical gaps and offers recommendations for future research. In addition, this study contributes not only to theory by enriching the biodiversity disclosure literature but also to practice by supporting companies in improving disclosure quality. It also offers policy-relevant insights by informing regulators in strengthening reporting standards.

The remainder of this paper is structured as follows. Section 2 discusses the literature review, while Section 3 elaborates on the methods, including how the data were collected and analyzed. Following that, Section 4 presents the key results that answer the research questions and connect them to the existing literature. Finally, Section 5 presents the conclusions and recommendations for further research.

2. Literature Review

Biodiversity disclosure refers to information that companies provide about their impacts, dependencies, and risks to ecosystems and natural resources (Bassen et al., 2025). This information is important because biodiversity underpins many ecosystem services that support human life and global economic activity (Elsayed, 2023; Ma et al., 2024). Research has shown that biodiversity loss can undermine financial stability, supply chains, and overall business resilience (Skouloudis et al., 2019). Additionally, it can increase physical risks for sectors such as agriculture and construction that rely heavily on ecosystem services (Xi, 2024). Conversely, investing in ecosystem conservation or restoration can create new opportunities for companies to generate long-term value while strengthening their relationships with investors and other stakeholders. Therefore, corporate biodiversity disclosure is urgently needed as it directly impacts the sustainability of businesses and the global economy (Treepongkaruna, 2024). Moreover, more than half of the world's GDP depends on healthy ecosystems, indicating that damage to biodiversity can directly affect the global economy. In this context, biodiversity disclosure serves as a

key mechanism for companies to show their environmental accountability while enhancing transparency for stakeholders (Elsayed, 2023). This is in line with the idea that socially responsible companies tend to perform better in the long term (Elsayed, 2023).

Theoretically, biodiversity disclosure can be explained using Legitimacy Theory and Institutional Theory (Boiral, 2016; Haque & Jones, 2020). From the Legitimacy Theory's perspective, companies disclose environmental information to maintain alignment with societal expectations. Meanwhile, Institutional Theory emphasizes the role of coercive, normative, and mimetic pressures in shaping disclosure practices. However, prior studies show differing interpretations, where some view biodiversity disclosure as symbolic compliance, while others consider it a reflection of substantive environmental performance. This conceptual divergence indicates that biodiversity disclosure is not yet fully established as a consistent accounting practice.

The implementation of biodiversity disclosure is greatly influenced by international regulations, such as the Convention on Biological Diversity (CBD) and the Taskforce on Nature-related Financial Disclosures (TNFD). However, despite increasing regulation, corporate biodiversity disclosure still lags behind climate change reporting. Data from CDP shows that only 7% of companies actively measure their impacts and dependencies on biodiversity. By comparison, more than 85% of companies have already assessed climate-related risks (Liang et al., 2024). This gap highlights the need to improve corporate capacity to more comprehensively monitor and report their environmental impacts, as biodiversity disclosure is not only relevant from a sustainability perspective but also has direct implications for corporate financial stability. At the same time, biodiversity policy disclosure has increased significantly in recent years. In the context of the US capital markets, around thirty-four percent of companies in the S&P 500 index had disclosed a biodiversity policy in 2022, nearly doubling the previous year (Bassen et al., 2025). This trend reflects the investor's growing attention to environmental and sustainability issues.

Although the literature highlights an increasing trend in biodiversity disclosure, there is a clear inconsistency between the growth of policy disclosures and their actual implementation. Many companies disclose biodiversity commitments at a symbolic level without providing quantitative indicators, reducing the comparability and decision-usefulness of such information. Additionally, biodiversity disclosure is rarely investigated in the academic discourse. Studies on this topic are still very limited and often qualitative in nature without clear quantitative metrics. Among the few was research by Senanayake et al. (2024), who found that only a small percentage of companies actually integrate biodiversity into their sustainability strategies. They show that although many companies mention biodiversity in their sustainability reports, few conduct science-based assessments to understand the impact of their operations on nature. This claim supports previous studies showing that biodiversity disclosure practices remain inconsistent across firms and industries, with limited comparability and a lack of standardized measurement frameworks (Senanayake et al., 2024; Skouloudis et al., 2019). Moreover, most empirical evidence is concentrated in developed countries, creating geographical bias and limiting the applicability of findings in emerging economies.

In particular, such issues are prevalent in developing countries, such as Indonesia. The level of biodiversity disclosure in Indonesia was relatively low compared to that in

developed countries such as the UK and Australia. This low level is often linked to weak local regulations and a lack of awareness of the importance of this issue among business actors. In comparison, research by [Maroun & Ecim \(2024\)](#) shows that strict regulations in the UK have encouraged companies to increase transparency in their biodiversity reporting. Thus, strategic steps are needed to improve biodiversity disclosure in Indonesia. For example, regulations such as Presidential Instruction No. 1 of 2023 can serve as an initial foundation for better sustainability reporting. However, its implementation must be strengthened with science-based technical guidance and cross-sector collaboration to maximize the benefits of Indonesia's rich biodiversity.

Another approach to improving biodiversity disclosure is the adoption of well-established reporting standards, such as the Global Reporting Initiative (GRI) Biodiversity Standard. GRI provides guidance to companies on how to report their impacts on biodiversity in a systematic and measurable manner ([Giannarakis, 2014](#)). This standard enables companies to benchmark their performance against industry peers while showcasing their commitment to the Sustainable Development Goals. Moreover, initiatives such as the Science-Based Targets for Nature help firms establish science-based targets to mitigate their adverse impacts on the natural environment. These targets are designed to ensure that business activities not only minimize damage but also contribute to the restoration of damaged ecosystems ([Zhu et al., 2024](#)).

Furthermore, pressure from institutional investors can also be a major driver for biodiversity disclosure. Investors are typically prioritizing sustainability as a key criterion in their investment decision-making. They prefer to select companies that openly disclose their business policies for managing ecosystems and natural resources within their value chains ([Skouloudis et al., 2019](#)). Thus, biodiversity disclosure can increase a company's investment appeal while strengthening its reputation in the global market. With increasing pressure from international regulators, institutional investors, and the public, transparency in environmental impact reporting is key for companies to maintain competitiveness while conserving natural resources essential to human survival ([Haque & Ntim, 2018](#)).

In addition to regulatory and reporting frameworks, market forces also play an important role in shaping biodiversity disclosure practices. Biodiversity disclosure also has a close relationship with corporate governance and investment strategy. According to [Ali et al.\(2024\)](#), institutional investors are increasingly paying attention to biodiversity policies as part of their investment decisions, particularly in industries that rely heavily on natural capital and ecosystem services. Thus, companies that are transparent in disclosing biodiversity information tend to be more attractive to sustainability-oriented investors. In the context of financial accounting, biodiversity disclosure is an important tool for stakeholders to evaluate a company's environmental performance. With increasing pressure from society and investors to be accountable for their environmental impact, it is important for companies to integrate biodiversity-related information into their annual reports or sustainability reports ([Senanayake et al., 2024](#)). This not only increases transparency but also helps companies build a positive reputation in the global market.

Overall, the literature shows that although biodiversity disclosure is still in its early stages of development compared to climate change reporting, there have been signs of significant progress in recent years. With increasing international regulation and investor

awareness of environmental issues, transparency in environmental impact reporting is key for companies to maintain competitiveness while contributing to natural resource conservation.

3. Research Method

This study employed bibliometric analysis to understand the disclosure of biodiversity in financial accounting. Bibliometric analysis, or scientometrics, is part of the research evaluation methodology and can be done with various approaches (van Eck & Waltman, 2014). The objective of this bibliometric analysis is to systematically identify publication trends, key contributors (authors, journals, and countries), and the intellectual structure of biodiversity disclosure research. In this study, bibliometric analysis refers to an approach that examines patterns in academic literature using citation analysis to identify influential publications, as well as relational techniques including co-citation analysis to examine intellectual linkages among references, co-authorship analysis to explore collaboration patterns among researchers, and keyword co-occurrence analysis to identify major research themes and clusters. These techniques are used consistently to capture evolutions of research trends and different dimensions of the research field. To build network visualizations in related literature, the RStudio software was applied.

To achieve the objective, this study analyzed articles that were indexed in the Scopus database. Previous studies have shown that the Scopus database is superior to Web of Science (WoS) for bibliometric analysis because of its wider coverage and easier data export. In the identification stage, important elements were considered, including source type, search engine, research category, language, keywords, and time span (Heersmink et al., 2011). Then, articles obtained from the Scopus database were selected based on several criteria. For example, the selected articles must be published between 2011 and 2025. Additionally, they must engage in business, management, accounting, economics, and finance. In addition, the search focused on studies written in the English language to avoid linguistic bias, while those in other languages were evaluated by authors with relevant expertise. Finally, this study analyzed only journal articles because they make a more significant contribution to theoretical and empirical discussions. These inclusion criteria are summarized in Table 1.

Table 1. Article Processed

Criteria	Screening
Keywords: "biodiversity" AND "financial accounting" OR "biodiversity disclosure" OR "biodiversity risk" OR "accounting" OR "biodiversity disclosure" OR "environmental deterioration"	4341
Year: 2011-2025	3780
Subject Area: Business, Management, and Accounting Economics, Econometrics, and Finance	320
Language: English	320

4. Result and Discussion

4.1. Publication Trends in Biodiversity Disclosure in Financial Accounting

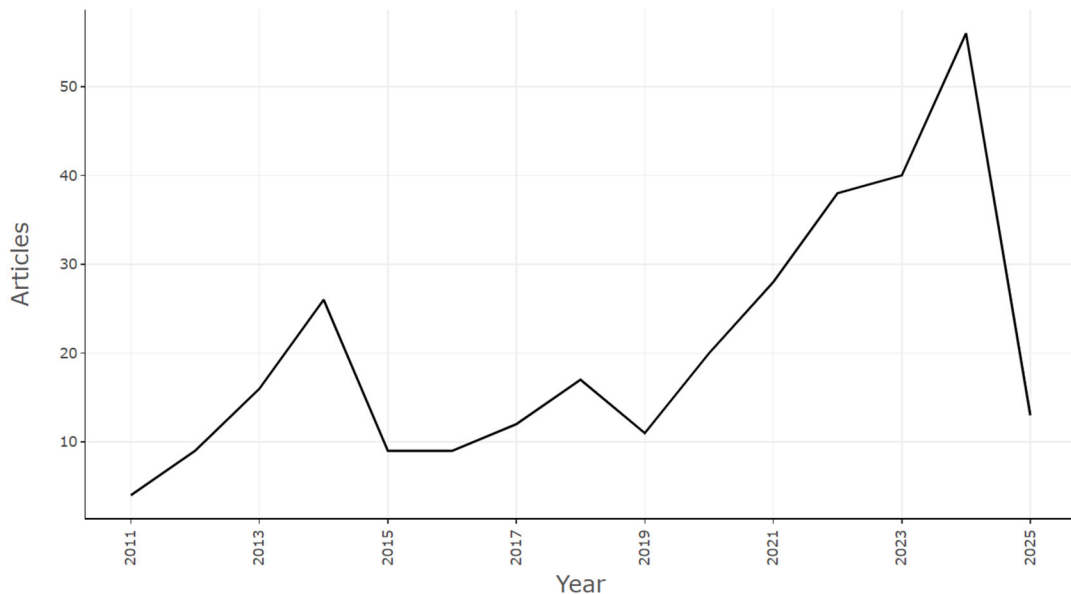


Figure 1. Publication Trends (Year)

Figure 1 shows that the number of publications on biodiversity disclosure within financial accounting has risen markedly in recent years. This upward trend indicates a growing global recognition of the critical role biodiversity plays in business practices and investment decisions (Ali et al., 2024). Since 2020, the number of studies discussing this topic has increased quite sharply, reaching a peak in 2024. This increase is in line with international sustainability regulations and the encouragement from various stakeholders who demand greater transparency in reporting on companies' environmental impacts (Maroun & Ecim, 2024).

One of the main factors driving this surge in publications is the role of international institutions such as the Global Reporting Initiative (GRI) and the Task Force on Nature-related Financial Disclosures (TNFD), as well as various government regulations that increasingly demand stricter reporting on environmental impacts. In addition, companies are beginning to realize that biodiversity is not only an environmental aspect that needs to be reported for compliance purposes, but also has strategic implications for their business continuity (Bassen et al., 2024). This change has prompted academics to explore how biodiversity can be systematically incorporated into financial accounting systems. This trend not only indicates a quantitative increase in publications but also reflects a structural shift in research priorities within financial accounting, where biodiversity is gradually moving from a peripheral issue to a core topic of sustainability discourse. This suggests that biodiversity disclosure is entering a phase of academic consolidation, in which foundational concepts and measurement approaches are beginning to stabilize. However, despite the increase in publications, the literature remains fragmented, with inconsistencies in measurement approaches and conceptual definitions. Some studies focus on disclosure quantity, while others emphasize quality or impact, indicating a lack of standardization in

the field. This inconsistency highlights a critical gap in developing a unified framework for biodiversity disclosure in financial accounting.

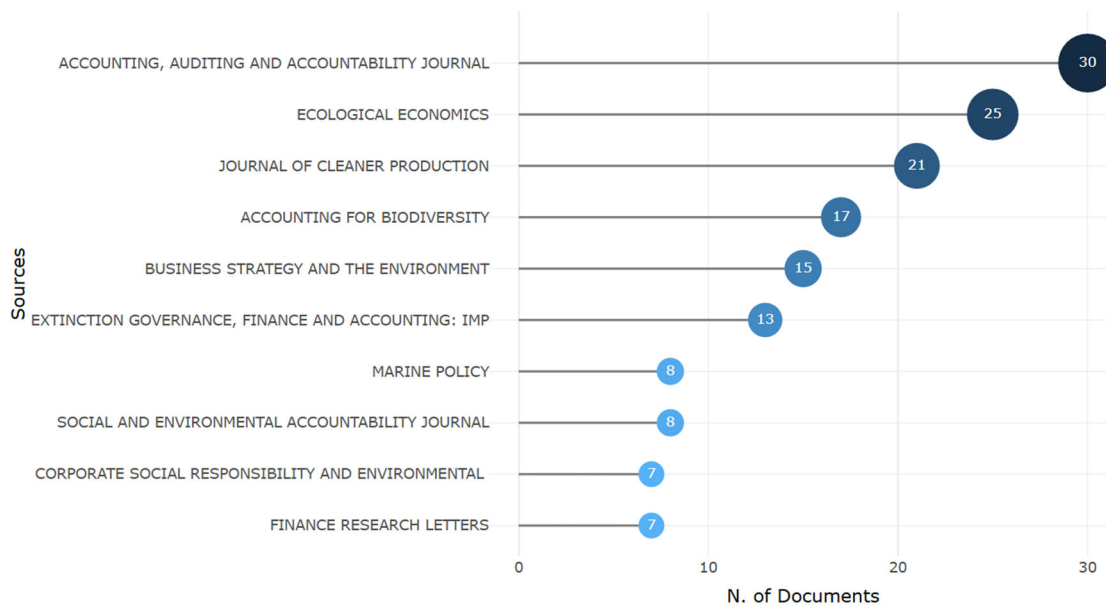


Figure 2. Publication Trends (Journals)

Furthermore, this study identified a significant increase in the number of papers published on environmental accounting, with biodiversity being one of the most interesting aspects. This publication is also driven by the development of international standards, such as the Sustainability Accounting Standards Board (SASB) and the European Sustainability Reporting Standards (ESRS), which have begun to emphasize the importance of including biodiversity in sustainability reports. This trend is also evident in the increasing number of journals specializing in sustainability and environmental accounting issues, such as the Accounting, Auditing & Accountability Journal and the Sustainability Accounting, Management and Policy Journal (see Figure 2). In addition, increasing public and investor awareness of the importance of environmental conservation has led to a surge in demands for companies to disclose how they manage their impact on biodiversity (Elsayed, 2023). This surge was also influenced by the adoption of Environmental, Social, and Governance (ESG) principles in investment, which increasingly emphasizes biodiversity as part of the environmental factors in business risk assessments. The concentration of publications in specific journals also indicates the emergence of intellectual hubs that shape the discourse on biodiversity accounting. These journals act as gatekeepers, influencing the direction and methodological rigor of future research. Nevertheless, the dominance of certain journals may also create publication bias, where alternative perspectives or interdisciplinary approaches are underrepresented. This raises concerns about the diversity of viewpoints and limits the development of more integrative frameworks.

4.2. The Most Influential Writers

The next finding of this study focuses on the authors who receive much appreciation and whose work has been repeatedly cited by scholars. As shown in Figure 3, two of the most influential authors in research related to biodiversity disclosure in financial

accounting are Jeffrey Atkins and Warren Maroun. Both have contributed significantly to research on integrating biodiversity in financial reporting into sustainability accounting. Atkins is known for his work on how accounting can capture the value of biodiversity that is often difficult to measure in traditional financial statements. Maroun, on the other hand, focuses on the audit aspect and how biodiversity can be included in financial statements to improve corporate transparency and accountability (Maroun & Ecim, 2024).

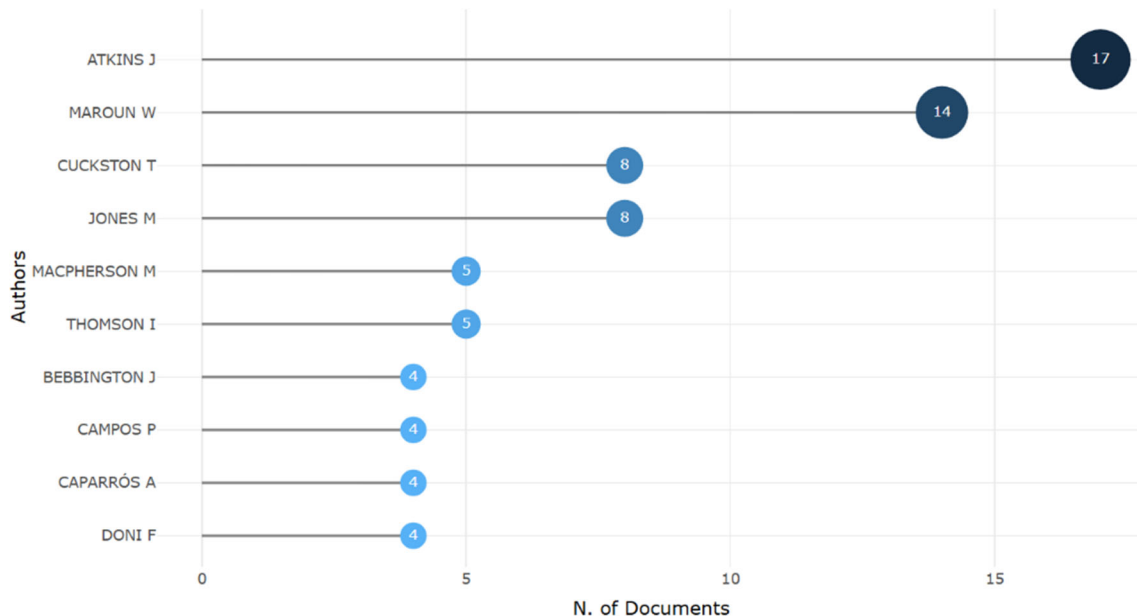


Figure 3. The Most Influential Writers

Their success in influencing research in this field can be attributed to their high number of publications and the frequent citation of their work by other academics. Their research has also served as the basis for various international standards on sustainability disclosure, which strengthen the relevance of their research. Furthermore, other studies have used their work as a primary reference for understanding how biodiversity can be measured and included in financial accounting systems. In addition to academic contributions, their research has also been widely used by regulators and audit bodies to develop a more holistic framework for assessing the impact of biodiversity on companies. The prominence of these authors suggests a relatively concentrated intellectual structure, in which a few key scholars significantly influence the development of the field. However, this concentration also indicates a potential limitation, as the field may rely heavily on specific theoretical and methodological approaches. Such a dependency might, in fact, potentially constrain innovation and alternative perspectives.

Most Contributing Academic Affiliations

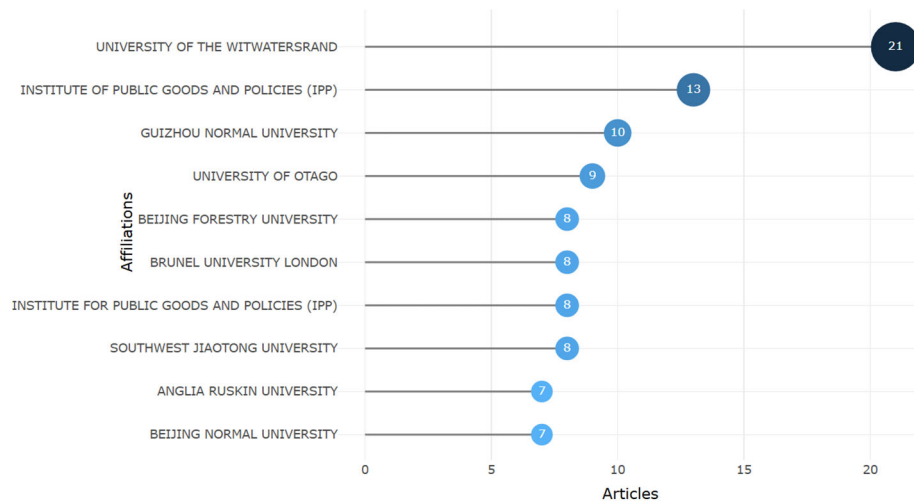


Figure 4. Most Contributing Academic Affiliations

This study also revealed the universities and institutions that have contributed the most to research on biodiversity and financial accounting. University of the Witwatersrand, for instance, has been named as one of the most influential institutions in this field (Figure 4). The university's high contribution is inseparable from the active role of its academics, such as Warren Maroun, a leading researcher in this field. Additionally, the university has a research center that focuses on sustainability accounting, which produces high-quality academic research on biodiversity and financial reporting.

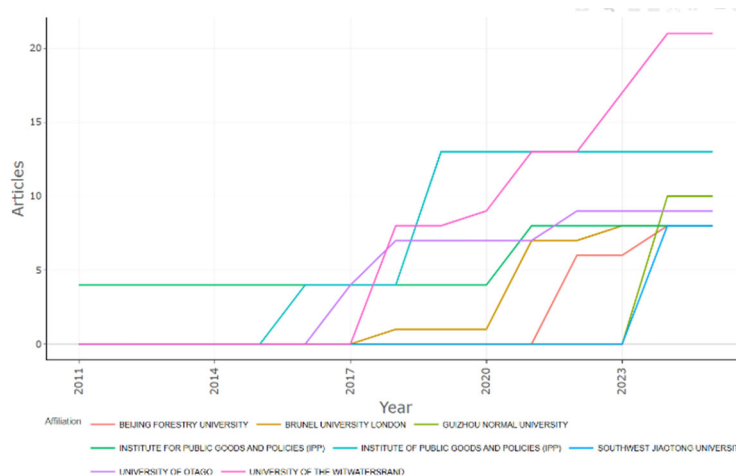


Figure 5. Most Contributing Academic Affiliations Graph

In addition to the aforementioned reasons, as shown in Figure 5, the University of the Witwatersrand has strong connections with various global institutions that promote sustainability accounting, such as the Global Reporting Initiative (GRI) and the International Integrated Reporting Council (IIRC). This factor makes the university a major research center in developing new methods for integrating biodiversity into corporate financial reporting. In addition, the university is located in South Africa, which

has rich biodiversity and vulnerable ecosystems. This geographical location also contributes to the increasing interest in this research. The dominance of certain institutions reflects the role of institutional support and research infrastructure in shaping scientific output in biodiversity accounting. At the same time, this pattern reveals a geographical imbalance, where research production is concentrated in specific regions, limiting the representation of perspectives from developing countries.

4.3. Countries with the Largest Contribution

Figure 6 illustrates the countries that have contributed the most to research on biodiversity and financial accounting. If we look at the depth of color, the UK, Australia, and China are among the countries with the highest contribution in this field. The UK has a long history of developing financial reporting and sustainability standards, with institutions such as the Financial Reporting Council (FRC), the Institute of Chartered Accountants in England and Wales (ICAEW), and leading universities active in this research. Also, the existence of reporting standards such as the Sustainability Accounting Standards Board (SASB) and the UK-based International Integrated Reporting Council (IIRC) has accelerated the research growth in this field. In addition, pressure from investors and stakeholders in the UK who are increasingly concerned about environmental impacts has encouraged companies to disclose more information about biodiversity. This finding supports the implementation of regulations such as the UK Corporate Governance Code, which requires companies to be more transparent in environmental and social aspects (Maroun & Ecim, 2024).

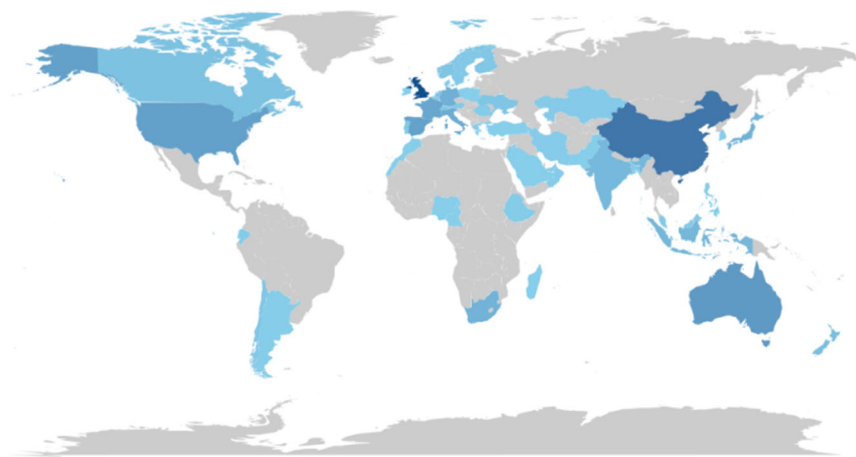


Figure 6. World Publication Distribution Map

Australia also makes a significant contribution to research on biodiversity in financial accounting because the country has high biodiversity and unique ecosystems, such as the Great Barrier Reef and tropical rainforests in Queensland. The Australian government's policies on nature conservation and sustainability increasingly require companies to report their impacts on biodiversity. In addition, the Australian Accounting Standards Board (AASB) has developed guidelines for incorporating sustainability elements in corporate

financial statements. This integration encourages academia to conduct research on this topic.

In Asia, China has made increasing contributions to this research area as government policies have shifted to place greater emphasis on sustainability in business activities. With rapid economic growth and increased industrial activity, the Chinese government has become stricter in implementing environmental regulations, including biodiversity reporting requirements. The Chinese government's policies, such as its ecological civilization program, have encouraged companies to be more transparent about their impact on the environment, including on biodiversity. In addition, more and more universities in China are researching how accounting standards can be adapted to reflect sustainability aspects, including biodiversity.

Figure 7 shows an interesting finding, as the country with the 2nd-largest biodiversity in the world (Indonesia) is not dominant in biodiversity research. The graph also shows that Indonesian researchers only conduct SCP (single-country publications) and do not publish MCP (multi-country publications) at all. This is because Indonesia focuses more on local biodiversity issues that are more relevant to national needs. This reporting is also more practical considering the limitations of resources, regulations, and existing technological capacity. In addition, cross-country coordination in MCP is considered too complex, while Indonesia still prioritizes strengthening internal capacity before collaborating internationally. These geographical distributions highlight the global disparity in research capacity and regulatory development related to biodiversity disclosure. In particular, the absence of MCP in Indonesia suggests limited international collaboration, which may hinder knowledge transfer and reduce the global visibility of research from developing countries. This indicates a need for stronger international research networks in the future.

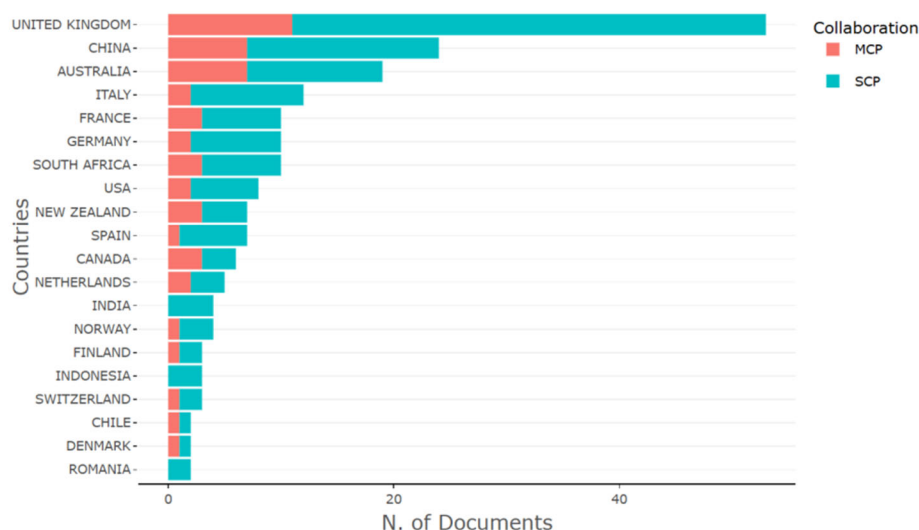


Figure 7. World Publication Distribution Diagram

4.4. Most Used Keywords

Both Figures 8 and 9 show that the most frequently used keyword in research on biodiversity in financial accounting is “biodiversity”. The use of this term reflects the

increasing academic focus on how biodiversity should be recognized and reported in corporate financial systems. The term “biodiversity” is often associated with the concept of sustainability in financial reporting and has attracted considerable attention in the academic literature in recent years. The dominance of general keywords such as “biodiversity” indicates that the field is still in an early stage of conceptual development. The lack of more specific or technical keywords suggests that the literature has not yet fully developed standardized terminologies, which may limit comparability across studies.

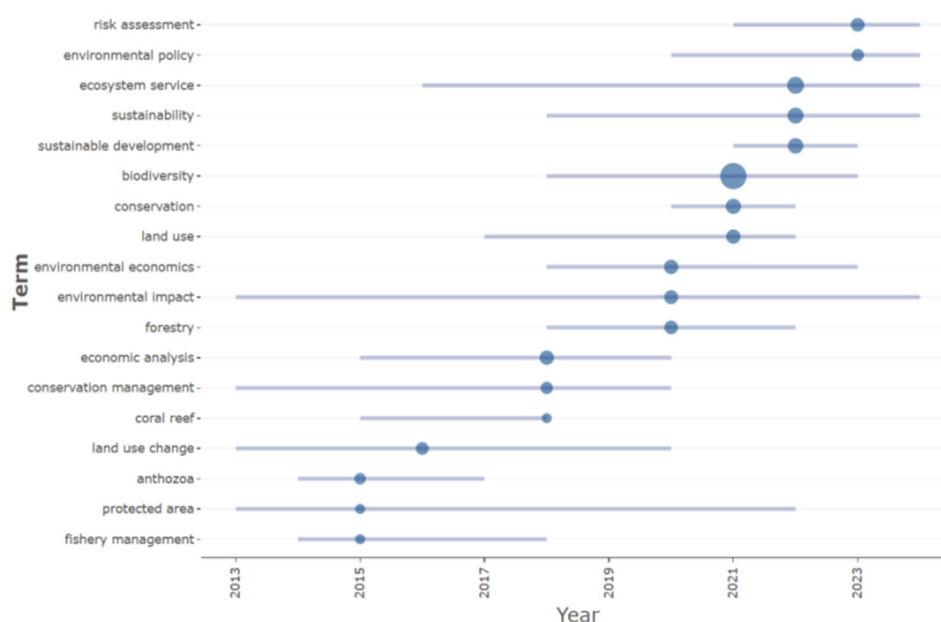


Figure 8. Bubble Plot Over Time for Keywords

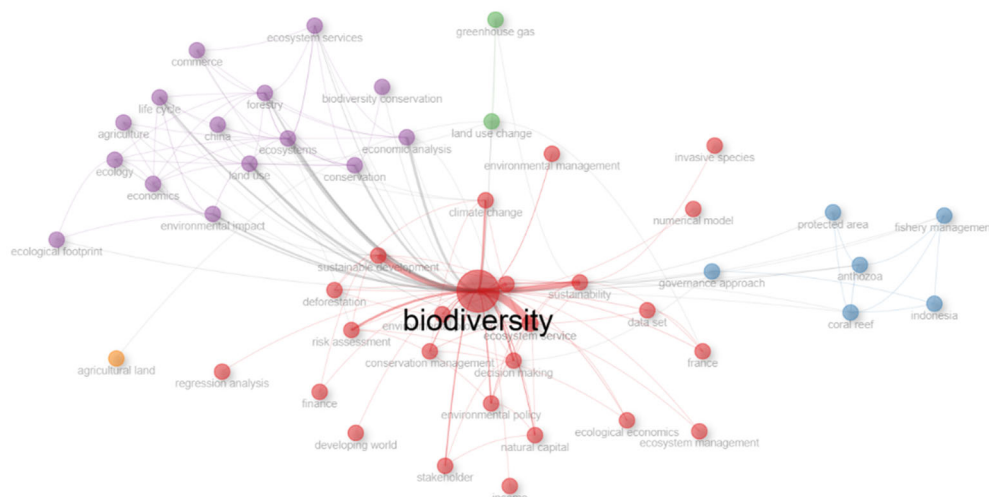


Figure 9. Overlay Visualization for Keywords

4.5. Analysis of Most Cited Publications in Biodiversity and Financial Accounting

After analyzing the most used keywords, this study also identified the most cited articles in the fields of biodiversity and financial accounting. As shown in Table 2, several publications can be regarded as the main references because they are widely cited by other

researchers. One of the studies with the highest number of citations is "Ecological footprint, economic complexity and carbon emissions: Evidence from Latin American countries" which has been cited 262 times. This study used quantile regression to analyze the relationships among economic complexity, ecological footprint, and carbon emissions across 37 Latin American countries between 1980 and 2016. The high number of citations indicates that this study is an important foundation in understanding how economic policies affect environmental impacts and biodiversity. In addition, this study is widely cited for providing strong empirical evidence on the relationship between economic policies and environmental footprints in developing countries. This topic is often overlooked in the mainstream literature.

Another frequently cited publication is "Critical aspects in the life cycle assessment of bio-based materials: A literature review" with 223 citations. This study offered a systematic review of the main issues surrounding life cycle assessment (LCA) of bio-based materials, particularly their environmental impacts. The sustainability of bio-based material utilization has become a significant concern for both industry and academia, making this study a valuable reference for companies when making strategic decisions related to biodiversity. In recent years, many multinational companies have begun to adopt LCA as a primary tool for assessing the environmental impacts of their supply chains, which has further encouraged the use of this research as a basis for policy formulation.

The study titled "Accounting for the Unaccountable: Biodiversity Reporting and the Limits of Financial Accounting" has also made a significant contribution, as reflected by its 191 citations. This study highlights the limitations of financial accounting in capturing biodiversity's value, as well as the strategies used by companies to report environmental aspects in sustainability reports. Academic interest in this research reflects growing recognition of the importance of integrating biodiversity aspects into financial reporting. Highly cited publications serve as the intellectual foundation of the field, shaping both theoretical and methodological developments. However, many of these highly cited studies are not directly focused on financial accounting, suggesting that biodiversity disclosure research still draws heavily on adjacent disciplines such as environmental science and economics. This reflects a lack of domain-specific maturity in this field.

Table 2. Articles with The Most Citations

Title	Cited
Ecological footprint, economic complexity and natural resources rents in Latin America: Empirical evidence using quantile regressions	262
Critical aspects in the life cycle assessment (LCA) of bio-based materials – Reviewing methodologies and deriving recommendations	223
Accounting for the Unaccountable: Biodiversity Reporting and Impression Management	191
Problematizing accounting for biodiversity	175
The interaction between milk and beef production and emissions from land use change e critical considerations in life	149

cycle assessment and carbon footprint studies of milk	
European firms' corporate biodiversity disclosures and board gender diversity from 2002 to 2016	131
Biodiversity reporting in Sweden: corporate disclosure and preparers' views	125
Collective Action Dynamics under External Rewards: Experimental Insights from Andean Farming Communities	122
Soil quality, properties, and functions in life cycle assessment: an evaluation of models	110
An Exploratory Study Based on a Questionnaire Concerning Green and Sustainable Finance, Corporate Social Responsibility, and Performance: Evidence from the Romanian Business Environment	109

4.6. The Use of Theory in Biodiversity Research and Financial Accounting

In research on biodiversity and financial accounting, several main theories are often used as conceptual frameworks (Table 3). One of the dominant theories is Legitimacy Theory. This theory argues that companies seek to gain social legitimacy by adjusting their reporting policies and practices according to the expectations of society and stakeholders. In biodiversity, companies use sustainability reporting to demonstrate their responsibility towards the environment in order to avoid regulatory and social pressures. Recent studies have also shown that companies in industries more affected by environmental crises tend to be more aggressive in adopting more transparent reporting practices to increase their legitimacy.

Table 3. Dominant Theoretical Frameworks in the Literature

Title	Theory
Accounting for the Unaccountable: Biodiversity Reporting and Impression Management	Legitimacy Theory
European firms' corporate biodiversity disclosures and board gender diversity from 2002 to 2016	Institutional Theory
Biodiversity reporting in Sweden: corporate disclosure and preparers' views Management	Legitimacy Theory
An Exploratory Study Based on a Questionnaire Concerning Green and Sustainable Finance, Corporate Social Responsibility, and Performance: Evidence from the Romanian Business Environment	Stakeholder Theory
Biodiversity and threatened species reporting by the top Fortune Global companies	Legitimacy Theory
Bringing tropical forest biodiversity conservation into financial accounting calculations	Market Construction Theory
Exploring factors relating to extinction disclosures: What motivates companies to report on biodiversity and species	Greenwashing Theory

protection?

The next popular theory is Institutional Theory. The theory explains how external pressures, such as government regulations and social norms, influence companies' biodiversity reporting practices. Studies using this theory show that companies tend to follow industry standards in disclosing biodiversity-related information to increase their credibility and competitiveness. In many countries, the adoption of stricter environmental regulations has increased the number of companies reporting their impacts on biodiversity, indicating that institutions play an important role in shaping organizational behavior.

Another relevant theory is Stakeholder Theory, which argues that companies have responsibilities not only to shareholders, but also to other stakeholders, including communities and governments. In biodiversity research, this theory is used to explain how companies interact with various parties to develop transparent, sustainable environmental policies. Recent research has shown that pressure from institutional investors and non-governmental organizations (NGOs) plays a key role in encouraging companies to improve their transparency and accountability in sustainability reporting. The dominance of legitimacy, institutional, and stakeholder theories indicates that biodiversity disclosure research is largely driven by socio-political and organizational perspectives. However, the limited use of alternative theories suggests theoretical homogeneity, which may restrict deeper exploration of biodiversity disclosure from other perspectives, such as behavioral or economic-based theories.

Through the combination of these theories, research on biodiversity and financial accounting continues to grow with a sharper focus on the social and environmental impacts of corporate activities. In recent years, there has been a shift from simply compliance-based reporting to integrating biodiversity into a company's core business strategy. The shift further emphasizes the importance of a multidisciplinary approach to understanding the relationship between accounting and sustainability.

4.7. Further Research Theme Directions

Figure 10 represents one of the key visuals in this study. It presents a thematic map that classifies topics into four quadrants based on their levels of density and centrality. Themes located in the upper-right quadrant are considered highly relevant and well-developed, indicating the need for further exploration. In contrast, themes in the upper-left quadrant are specialized and less connected but still exhibit a high level of development. The lower-left quadrant contains themes that appear to be declining or less significant, while the lower-right quadrant includes fundamental themes that are important (high centrality) but not yet fully developed (low density). Overall, the thematic map highlights a connection among three main themes: biodiversity, sustainable development, and risk assessment.

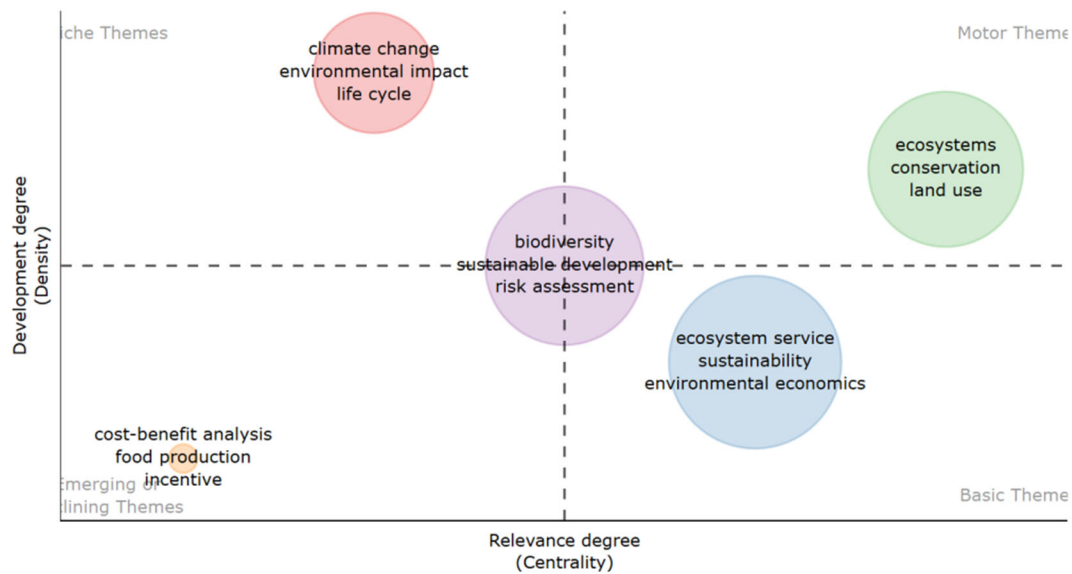


Figure 10. Thematic Map Diagram

This study suggests future research to examine the link between biodiversity disclosure and financial accounting as it offers substantial opportunities and remain highly viable. This is reflected in their strong centrality despite limited scholarly attention to date, as evidenced by the positioning of the environmental economics theme in the lower-right quadrant. The thematic map provides deeper insights into the intellectual structure of the field by identifying clusters of research themes based on their centrality and density. More specifically, themes in the lower right quadrant (basic themes), such as environmental economics, indicate foundational topics that are important but underdeveloped, while themes in the upper right quadrant (motor themes) represent well-developed and influential areas. Emerging or declining themes in the lower left quadrant suggest areas that require further investigation or may be losing relevance. This classification highlights the dynamic evolution of biodiversity disclosure research and identifies clear directions for future studies.

In keyword analysis quadrants, biodiversity is usually located in the sustainability and non-financial reporting quadrant, indicating that research on this topic focuses more on how companies disclose their environmental impacts than on the technical aspects of traditional financial accounting. In addition, biodiversity is often associated with terms such as "sustainability reporting", "environmental accounting", and "ecosystem services", indicating that research in this area is increasingly developing in the broader context of sustainability reporting.

5. Conclusion, Implications, and Limitations

Research on biodiversity disclosure in financial accounting has increased significantly since 2020, driven by global awareness, regulatory pressure, and investor demand for transparency. The surge in publications, reaching its highest point in 2024, suggests a transition from treating biodiversity solely as an environmental concern to recognizing it as a strategic component of corporate and accounting practices, reinforced by frameworks such as the Global Reporting Initiative (GRI) and Environmental, Social, and Governance

(ESG). Key contributors such as Atkins J. and Maroun W. have advanced the understanding of biodiversity reporting, while institutions such as the University of the Witwatersrand play a central role in knowledge development. Geographically, research is dominated by the UK, Australia, and China, with limited contributions from developing countries despite their high biodiversity.

This study provides empirical evidence through bibliometric analysis, showing clear patterns in publication growth, key contributors, and thematic development. The findings indicate that biodiversity disclosure research is expanding but remains fragmented and lacks standardized measurement approaches. Although research has progressed, important gaps remain, particularly in developing quantitative accounting models, linking biodiversity to financial risk, and expanding cross-country comparative studies.

However, this study is limited by its reliance on the Scopus database, English-language publications, and selected subject areas, which may restrict the coverage of relevant literature. In practice, the findings highlight the need for regulators to strengthen frameworks such as TNFD and GRI to improve reporting consistency. For companies, integrating biodiversity into financial decision-making is essential, while for academics, this study offers a structured overview of research trends and gaps. Future research should focus on standardized accounting models, empirical validation, and interdisciplinary approaches to better capture biodiversity impacts on financial performance.

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Conflict of Interest

No potential conflict of interest was reported by the authors.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions

Arum Kusumaningdyah Adiati: Conceptualization, Methodology.

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