

New Connectedness Trends in Islamic Finance: A bibliometric Analysis of Biodiversity, Sustainability, and Social Impacts

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Abstract

Backgrounds: The increase in Islamic finance post COVID-19 has been the main focus of researchers. This event made humans realize that the issue of losing biodiversity due to human actions, secondly, to achieve the 2030 SDGs target, it is necessary to discuss how the sustainability system. Third, humans as controllers of the sustainability system whether this issue is able to overcome its impact on society.

Objectives: This research aims to map the role of Islamic finance in addressing issues on biodiversity, sustainability, and social impact.

Novelty: Through this research, SDG observers can inspire further exploration and linkages so as to analyze sustainable Islamic financial instruments after the SDG program.

Research Methodology: This study uses bibliometric methods with 3 research linkage analyses namely Co-Occurance, and Coupling Bibliometrics with document and country data. Measured using the VOSviewer tool, we uncover publication trends, coupling that focuses on the documents of this research, and the integration of countries that conduct research.

Findings: The results show that there is an association between variables and Islamic finance. This study provides recommendations for future research to improve understanding of the implications of other Islamic finance instruments on biodiversity, sustainability and social impact.

Implication: This research can provide implications for future researchers, state regulation, and sustainability-focused companies. Republics and Islamic countries can update regulations on the provision of sustainability standards by adjusting the link between biodiversity.

Keywords:

Islamic finance, Biodiversity, Sustainability, social impact, SDGs

JEL Classifications:

F64, Q51, Q56

Received: October 12, 2024; Revised: November 9, 2024; Accepted: November 20, 2024;
Available online: November 30, 2024

A. Introduction

The Sustainable development Goals (SDGs) are goals that point to the political economy factors that lead to forest resource degradation and establish a bio-environmental interaction framework with the distribution of power in production activities by political economy growth (Titumir et al., 2022), with institutional fragility coupled with commercialization leading to private gains obtained by using political power resulting in the degradation of forest resources, so that political dynamics and economic growth grow as contributors to environmental problems. (Balsalobre-Lorente & Shah, 2024). The SDGs are also the main goal for economic growth in the development of Islamic finance. (Harahap et al., 2023). in countries with predominantly Muslim populations (Harahap et al., 2023)) in countries with a majority Muslim population (Musari, 2022). One of the instruments that is ready to be a driver of the world of sustainable Islamic finance is Sukuk (A. A. Yusuf & Maryam, 2024), because Sukuk represents asset ownership that encourages a more ethical and responsible investment approach.

According to The Islamic Corporation for the Development of the Private Sector (ICD), the private sector development arm of the Islamic Development Bank Group (IsDB), and the London Stock Exchange Group (LSEG), the world's leading provider of financial markets data and infrastructure, makes a report to present this edition of the Islamic Finance Development 2023, They would inform that Islamic Finance has significant increase on Assets Growth level since 2016. According to this presentation, they have a target to grow until 2027 and achieve a level of 6,667 USD Billion on Assets (ICD-Refinitive, 2020). This means that with the target of achieving 2027, the rapid and significant development of Islamic finance is very important for researchers to study the analysis of the connections that can affect Islamic finance in the future (The Financial Services Authority (OJK), 2023). So that in order to achieve the SDGs, it can utilize the environmental and Islamic finance ties by megabiodiversity countries and countries with a majority Muslim population (Von Rintelen et al., 2017),

A mega biodiversity country is a country that has various types of living things both on land and in water that are very abundant with their own uniqueness (Sukardiyono & Rosana, 2019) However, since the increase in economic activities without regard to the environment which has caused a negative impact on the world environment, the population of animals and fauna has decreased by an average of 69%. This is due to human behavior that focuses on profit and benefits (Flammer et al., 2023) by building infrastructure that causes air pollution, natural areas are eroded and causes negative impacts on the environment without thinking about sustainability (Abid et al., 2024). Therefore, biodiversity biological matters have become important and urgent to analyze in terms of their relationship to sustainability.

Sustainability is an aspect to examine the sustainability of living things, be it humans, plants, animals, etc. (Grossmann et al., 2022). More than half of the world's population lives in urban areas so that a large population will affect two aspects, namely the social environment and health (Bentley, 2014). An environment influenced by

population density will give rise to a shortage of jobs and cause an increase in poverty (Remeikienė & Gaspareniene, 2023) resulting in an increase in credit customers (Singh et al., 2023), the social impact that is seen to hamper efforts to achieve the SDGs. Second, the Health aspect is an aspect that greatly affects the food needs of the future population so that changes are needed in the average human diet and the high amount of food loss (Remeikienė & Gaspareniene, 2023). Thus, currently the sustainability of human survival is influenced by environmental diversity. For this reason, the role of Islamic finance as an indicator that can be controlled by humans can bridge. Islamic finance has several principles from the Qur'an and Hadith to overcome the above problems, such as prohibiting usury to avoid human habits of debt which causes increased poverty (Munir et al., 2023), prohibiting eating carrion and alcoholic drinks which cause human health problems (Canavan et al., 2016), and continuing to work to protect the earth's environment as a caliph in the world (Sacarcelik, 2018).

Strengthening Islamic finance provides a very interesting trigger for researchers to analyze the linkages to the direction of future Islamic finance research. This research is expected to contribute to improving the sustainability of human survival through the development of Islamic finance to achieve the ICD 2027 renewal target and efforts to achieve the SDGs 2030. This research will explain the interconnectedness of the current food system that produces too many of the wrong types of food and continues to ignore the enormous global wealth of nutrient-rich and underutilized food biodiversity (Seidl & Nunes, 2019) which hampers the sustainability of human survival. This research will also explain the interconnectedness of social and ecological poverty trap factors that will affect the feedback process from social impacts (Yang et al., 2023) to sustainability. So that it will create a connection between research towards sustainability, this research will produce indicators that utilize the role of Islamic finance as a bridge to play a role in efforts to achieve SDGs from the social impacts of poverty and the environment on Health (Kickbusch & Alakija, 2023).

B. Literature Review

Islam provides a holistic approach in addressing the current global crisis in the face of biodiversity loss because Islam encourages a balance of conservation with sustainable use of nature and the rich resources it contains (Harahap et al., 2023; Tok et al., 2022) can be seen from the rules of Islamic finance, namely as the rules and principles of transactions must be in accordance with the teachings of Islam (Alhammadi, 2022) as in the letter Al-Baqarah: 60 which is referred to as Maqasid, meaning that we must protect this earth and must not cause damage (Fageh, 2018). Human behavior that cares about the environment is in accordance with the UN program regarding SDGs in 2015, which forms an ecological/circular economy into a new financial architecture system or concept (Tariqullah Khan, 2019). The following is a literature review table of several studies by linking the connectivity between variables that give rise to the concept of new Islamic finance.

Table 1. List of Library Review Finance – Biodiversity

| No. | Title | Researchers | Years | Connections |
|-----|---|---|-------|--|
| 1. | The inclusion of biodiversity into Environmental, Social, and Governance (ESG) framework: A strategic integration of ecocentric extinction accounting | Helen Kopnina, Scarlett Ruopiao Zhang, Sam Anthony, Abeer Hassan, Warren Maroun | 2024 | Charting the course for the advancement of commercial practices focused on biodiversity protection. Corporations, non-profit entities, and national governments serve as catalysts for the sustainable utilization and conservation of resources, endorsing the diminishment of reliance on natural resources and mitigating habitat degradation and biodiversity decline. (Kopnina et al., 2024). |
| 2. | The effectiveness of national biodiversity investments to protect the wealth of nature | Andrew Seidl, Kelvin Mulungu, Marco Arlaud, Onno van den Heuvel and Massimiliano Riva | | Population expansion correlates with a rise in the percentage of endangered species compared to the total species within a country and a decline in financial support for biodiversity (Seidl et al., 2021). |
| 3. | Socioeconomic influences on biodiversity, ecosystem services and human well-being: A quantitative application of the DPSIR model in Jiangsu, China | Ying Hou, Shudong Zhou, Benjamin Burkhard, Felix Müller | 2014 | The DPSIR model (Driver-Pressure-State-Impact) effectively encapsulates socioeconomic variables affecting biodiversity, ecological services, and human well-being within regional human-environment systems (Hou et al., 2014) |
| 4. | The Effect of Carbon Credits on Savanna Land Management and Priorities for Biodiversity Conservation | Lucinda L. Douglass, Hugh P. Possingham, Josie Carwardine, Carissa J. Klein, Stephen H. Roxburgh, Jeremy Russell-Smith, | 2011 | Enhanced carbon stock management might augment carbon income by around US\$5 per hectare year and save the emission of 1–2 billion tonnes of carbon dioxide equivalent over a span of roughly 90 years. The objectives are to conserve biodiversity and mitigate greenhouse gas emissions (Douglass et al., 2011) |
| 5. | Heavy reliance on private finance alone will not deliver conservation goals | Katie Kedward, Sophus zu Ermgassen, Josh Ryan-Collins, Sven Wunder | 2023 | Macroeconomics is used to mitigate environmental degradation by guaranteeing the availability of vital ecosystem services for sustained productivity and economic resilience (Kedward et al., 2023) |
| 6. | Loss and damage finance should apply to biodiversity loss | Dilys Roe, Ebony Holland, Nora Nisi, Tom Mitchell & Tasfia Tasnim | 2023 | Confronting justice concerns and mitigating biodiversity decline to improve the implementation of the global biodiversity framework (GBF) (Roe, 2023) |

| No. | Title | Researchers | Years | Connections |
|-----|--|--|-------|---|
| 7. | Crowdfunding biodiversity conservation | allo-Cajiao, E., Archibald, C., Friedman, R., Steven, R., Fuller, R. A., Game, E. T., & Ritchie, E. G. | 2018 | Despite the relatively low amount of funds produced via crowdsourcing compared to other conservation finance tools, its contributions beyond mere research funding and capital provision (Gallo-Cajiao et al., 2018) |
| 8. | Exploring sustainable scenarios in debt-based social-ecological systems: The case for palm oil production in Indonesia | Julen Gonzalez-Redin, J. Gareth Polhill, Terence P. Dawson, Rosemary Hill, Iain J. Gordon | 2020 | Debt-fueled economic prosperity may facilitate environmental conservation, provided that the state's role in environmental protection is enhanced (Gonzalez-Redin et al., 2020) |
| 9. | The Case for Public Financing of Environmental Common Goods for Health | Selina Lo, Sylvestre Gaudin, Carlos Corvalan, Alexandra J. Earle, Odd Hanssen, Annette Prüss-Ustun, Maria Neira & Agnès Soucat | 2019 | Countries that strive to protect the health of future generations must look beyond election cycles to implement policies that protect the environment and fund environmental CGH (Common Goods for Health) (Lo et al., 2019) |
| 10. | Integrating biodiversity into financial decision-making: Challenges and four principles | Christoph Nedopil | 2023 | Costs, revenues, and risks have not yet been adequately integrated into biodiversity funding (Nedopil, 2023) Four measures are required: (1) regulations must impose restrictions on natural resource exploitation; (2) financial risk assessments concerning biodiversity should prioritise local risks; (3) augmented biodiversity funding ought to capitalise on the ancillary benefits of biodiversity, particularly when integrated with climate funding; and (4) the advancement of biodiversity funding must be collaboratively directed and endorsed by financial decision-makers |
| 11. | The Biodiversity Finance Initiative: An Approach to Identify and Implement Biodiversity-Centered Finance Solutions for Sustainable Development | Marco Arlaud, Tracey Cumming, Ian Dickie, Marlon Flores, Onno van den Heuvel, David Meyers, Massimiliano Riva, Andrew Seidl and Annabelle Trinidad | 2018 | IOFIN principally aims to enhance the national biodiversity finance framework and to address the national financial deficit for the protection and sustainable use of biodiversity. (Arlaud, 2018) |

| No. | Title | Researchers | Years | Connections |
|-----|---|------------------------------|---------|--|
| 12 | A bibliometric and systemic literature review of biodiversity finance | Mark Hutchinson, Brian Lucey | C. 2024 | The opportunity to capitalise on the absence of finance-oriented solutions. We promote the acknowledgement of finance's crucial role in tackling biodiversity issues, highlighting the enhancement of capital accessibility and risk management (Hutchinson, 2024) |

Through reading previous studies it is explained that the important role in finance can be the sustainability of biodiversity influenced by the role of business, organizations, and government of the country in regulating the regulation of sustainable use and conservation of resources so as to raise issues of justice and address the problem of biodiversity loss. Because human growth is related to low biodiversity which causes such as reducing greenhouse gas emissions, regulations must set Limits on natural exploitation, local risks, increased funding and state-led organization. So, there is another role to eradicate the problem of biodiversity, namely socioeconomic factors. There are social factors from the community to be able to form crowdfunding capital, debt and rent with a state system that can support environmental conservation as a form of macroeconomics to reverse the loss of nature. The provision of ecosystem functions can affect the health of future generations as an impact on social factors for the sustainability of human survival. The following table explains the sustainability variables that occur.

Table 2. List of Library Review Islamic Finance - Sustainability

| No. | Titles | Researchers | Years | Connections |
|-----|--|---|-------|--|
| 1. | Integrating sustainable Islamic finance: An Analytical Network Process using the Benefit Opportunity Cost Risk (ANP BOCR) framework: The case of Indonesia | Tika Widiastuti, Anidah RobaniI, Puji Sucia Sukmaningrum, Imron Mawardi, Sri Ningsih, Sri Herianingrum, Muhammad Ubaidillah Al-Mustofa1 | 2022 | The enhancement of human resource quality for effective technology utilisation is essential, with experts deeming national data integration the most vital option (Widiastuti et al., 2022) to enhance technological management for Islamic philanthropy administrators. |
| 2. | A Qualitative Review on Islamic Sustainable Finance | Silma Lafifa Sunarya, Aam Slamet Rusydiana | 2022 | The majority assert that the development of Islamic finance is sustainable throughout banking, social funding, waqf, and the economy (Sunarya & Rusydiana, 2022) |
| 3. | Instruments of Islamic Sustainable Finance | Romzie Rosman, Nur Harena Redzuan, dan Siti Saffa' Shaharuddin | 2024 | To attain Islamic sustainable finance, two essential tools are required: Sharia-compliant contracts and various social transfer mechanisms. The majority assert that the advancement of Islamic finance is sustainable across banking, social financing, waqf, and economic dimensions (Rosman et al., 2024) |

| No. | Titles | Researchers | Years | Connections |
|-----|--|--|-------|--|
| 4. | Sustainable Islamic Finance: A Min-Review | Mohammad Bayzid, Haitham Nobanee | 2020 | The implementation of an Islamic financial system in the future may mitigate excessive volatility (Bayzid & Nobanee, 2020) |
| 5. | The Power of Faith-Based Finance | Yusuf, T. O., Raimi, L., & Shuaib, A. A. | 2024 | Islamic banking serves as a mechanism to expedite the achievement of the Sustainable Development Goals via its foundational ideas (zakat dan waqf) (T. O. Yusuf et al., 2024) |
| 6. | A Study on the Role of Islamic Finance and Sustainable Development Goals | S. Dhana Bagiyam, Salih Mustafa Ahmed Mualley, Libeesh P. C. | 2023 | there is a wide gap between Islamic finance supporting the SDGs based on keyword data and articles from previous researchers (Bagiyam et al., 2023) |
| 7. | Financial Instruments and Cash Waqf, Bridging Islamic Finance with Sustainable Development Goals | Ahmed Tahiri Jouti | 2022 | The revitalisation of waqf and zakat might significantly mitigate the hazards of climate change and inequality in Islamic nations via novel financial mechanisms that function as autonomous, small-scale sub-ecosystems (Jouti, 2022) |
| 8. | Islamic Social Finance: A Bibliometric Analysis | Nurizal Ismaila, and Siti Aisyah | 2021 | The predominant terms in Islamic finance research are Islamic social finance, maqasid sharia, value-based intermediation, sustainable development objectives, and waqf. Six groups address the function of Islamic social finance in relation to Covid-19, cultural and national case studies on Islamic social finance, sustainable development objectives, ecosystems, and maqashid sharia (Ismail & Aisyah, 2022) |
| 9. | Sustainable Finance and a Shari' Analysis of Environmental, Social and Governance (ESG) Criteria | Aminudin Ma'ruf, Ziyaad Mahomed, and Shamsher Mohamad | 2021 | The state must develop the primary indicators of similarities and differences in each sub-element of the ESG component of Sharia norms and principles, which may be actually implemented in Islamic Ethical Finance (Ma'ruf et al., 2021) |

The role of the connected state in solving biodiversity problems is important for improving the quality of human resources, the table above explains that improving human resources in utilizing technology that can reduce high volatility. The improvement of human resources above will affect the development of Islamic finance with two special instruments, namely compliance contracts with Islamic provisions and social redistribution. This can be done from the banking, social financing, waqf, and economic sides. The practice of waqf and zakat also plays an important role for human resources to control Islamic finance in an effective contribution to reducing the risk of climate change. ESG is one of the concepts of the connection between biodiversity, social, and Islamic finance but with Sharia rules and principles, which can be applied practically and formulated by the state. So that the development of Islamic social finance, maqasid Sharia, sustainable development goals become the main case of the sustainability of human survival as a social impact on the country. The following table explains the social impacts that occur due to the connection of these variables.

Table 3. List of Literature Review Islamic Finance - Social Impact

| No. | Titles | Researchers | Years | Connections |
|-----|---|---|-------|---|
| 1. | Islamic Finance and Social Sustainability: parameters for Developing A Model For Social Impact Measurement. | Saadiah Mohamad, Nur Amirah Borhan | 2017 | Islamic finance is an extensive financial framework designed to promote sustainable socio-economic growth and establish a fair society, as reflected in the principles of maqasid al-shariah (Mohamad & Borhan, 2017) |
| 2. | The Role of Islamic Social Finance in Poverty Eradication | Ahmed Imran Hunjra, Murugesh Arunachalam, Mahnoor Hanif | 2024 | Waqf and Zakat are essential elements of Islamic social finance that significantly contribute to alleviating financial deficiencies and establishing a strong social safety net. Islamic finance is an extensive financial framework designed to promote sustainable socio-economic growth and foster a fair society, as reflected in the principles of maqasid al-shariah (Hunjra et al., 2024) |
| 3. | Does Islamic financial development foster economic growth? International evidence | Hilal Anwar Butt and Mohsin Sadaqat | 2023 | The beneficial impact of Islamic finance on economic development, aligning with prior studies and supporting the supply-leading theory, highlights the significance of the Islamic finance sector. Waqf and Zakat are essential elements of Islamic social finance that significantly contribute to alleviating financial deficiencies and establishing a strong social safety net. Islamic finance is an extensive financial framework designed to promote sustainable socio-economic growth and foster a fair society, as reflected in the principles of maqasid al-shariah (Butt et al., 2023) |

| No. | Titles | Researchers | Years | Connections |
|-----|--|---|-------|--|
| 4. | The Impact of Islamic Finance, Economic Growth, And Globalization on CO2 Emissions | Yasirwan, Imsar, and Muhammad Ikhsan Harahap | 2024 | Islamic finance, economic expansion, and globalisation together contribute to carbon dioxide emissions across economic, social, political, and overall dimensions (Yasirwan et al., 2024) |
| 5. | A bibliometric review of Islamic economics and finance bibliometric papers: an overview of the future of Islamic economics and finance | Denizar Abdurrahman Mi'raj, Salih Ulev | 2024 | The results concerning Islamic economics and finance are categorised into five distinct groups: (1) Islamic social finance and microfinance; (2) Technological integration in Islamic financial institutions; (3) Sharia compliance and governance within the Islamic sector; (4) Islamic marketing and halal food supply chains; and (5) Productivity in Islamic economics and finance research (Mi'raj & Ulev, 2024) |
| 6. | Institutionalizing social impact investing: implications for Islamic finance | Jeffrey Kappen and Matthew Mitchell, Kavilash Chawla | 2019 | Sharia investing offers a means to enhance and implement Maqasid-al-Sharia within the methodologies used by the Sharia-compliant investment sector for assessing investment assets (Kappen et al., 2019) |
| 7. | Islamic Finance for Social Good: Exploring the Synergy Between Sukuk and Waqf | Izzatul Afrina | 2024 | The investigation of the interplay between sukuk and waqf within Islamic finance has uncovered a potent alliance capable of tackling many social and economic issues (Izzatul Afrina, 2024) |
| 8. | New insights on social finance research in the sustainable development context | Juan David Gonzalez-Ruiz, Nini Johana Marín-Rodríguez, Olaf Weber | 2024 | Presenting several significant advanced research, including social banking, Islamic finance, social innovation, the repercussions of the COVID-19 pandemic, impact investment, social impact bonds, and the Sustainable Development Goals (Gonzalez-Ruiz et al., 2024) |

Sustainable goals as social impact bonds, sustainable socio-economic development will create a just society, as manifested in the principles of maqasid alshariah. Islamic finance, economic growth, and simultaneously contribute to biodiversity because it affects carbon dioxide emissions produced by plants. The importance of the Islamic finance industry in sukuk, waqf and zakat instruments is an exploration of synergy within the framework of Islamic finance that reveals a combination of overcoming various social and economic challenges. So that the formation of Islamic social finance is seen from Islamic social finance and microfinance, Use of technology in Islamic financial institutions, Sharia compliance and good governance institutions in the Islamic industry, Islamic marketing and halal food supply chains and Productivity of Islamic economic and financial research. Islamic social finance as an investment provides an opportunity to further develop and operationalize Maqasid-al-Sharia into the process of evaluating economic assets in designing sustainability.

From the literature review, it can be seen that research on Islamic finance is still very limited. This biodiversity research is based on the words "bio" and "diversity", where biodiversity comes from the word bioeconomy. Bioeconomy is a new value chain field that is being developed and is related to sustainability issues, especially those based on bio, land use, material efficiency and commercialized energy or water needs (Pursula et al., 2018) The issue of biodiversity that is used as research material is due to the loss of biodiversity, so sustainability is needed in discussing biodiversity issues. There is a relationship that bridges the two variables. Biodiversity requires a comprehensive sustainability assessment to develop a sustainable bioeconomy (Pursula et al., 2018). There are sustainability benchmarks unsystematic biodiversity, this is necessary because it is needed to eliminate gaps in assessing the sustainability of bio-based value chains, supporting the inherent target of bioeconomy to utilize bio-based resources (Arlaud, 2018) in bridging sustainability and biodiversity to be able to bridge to The social impact aspect requires three conditions, namely social trust, social norms, cultural perceptions and values, and network value characteristics (Petropoulou et al., 2018). If these social impacts are met, they can help sustainable biodiversity programs. However, what is different in this study is that to implement these three interrelated aspects, Islamic financial instruments are needed. The Islamic financial instrument that is able to guarantee these aspects is takaful (Sabrina & Rulindo, 2023).

This research is formed and important despite the limitations of research on Islamic finance variables, biodiversity, sustainability, and social impacts also because the researcher analyzes the relationship between variables. This research is new because it aims to find reciprocal relationships between variables.

C. Research Methodology

Researchers try to analyze the relationship between the three aspects, namely biodiversity, sustainability, and social impacts that are bridged by Islamic financial transactions. This study conducted a library mapping using the dimension.AI website as a tool in this study. Using three bibliometric analyzes, namely Co-Occurance which is used to analyze the direction of future research related to Islamic finance biodiversity, sustainable Islamic finance, and Islamic finance-social impact. The second analysis is bibliometric coupling with two types, namely source and country. This coupling is used to determine the combination of objects and focus of researchers in a study with the keywords of the three variables. Bibliometric analysis was measured using the VosViewers application version 1.6.19.

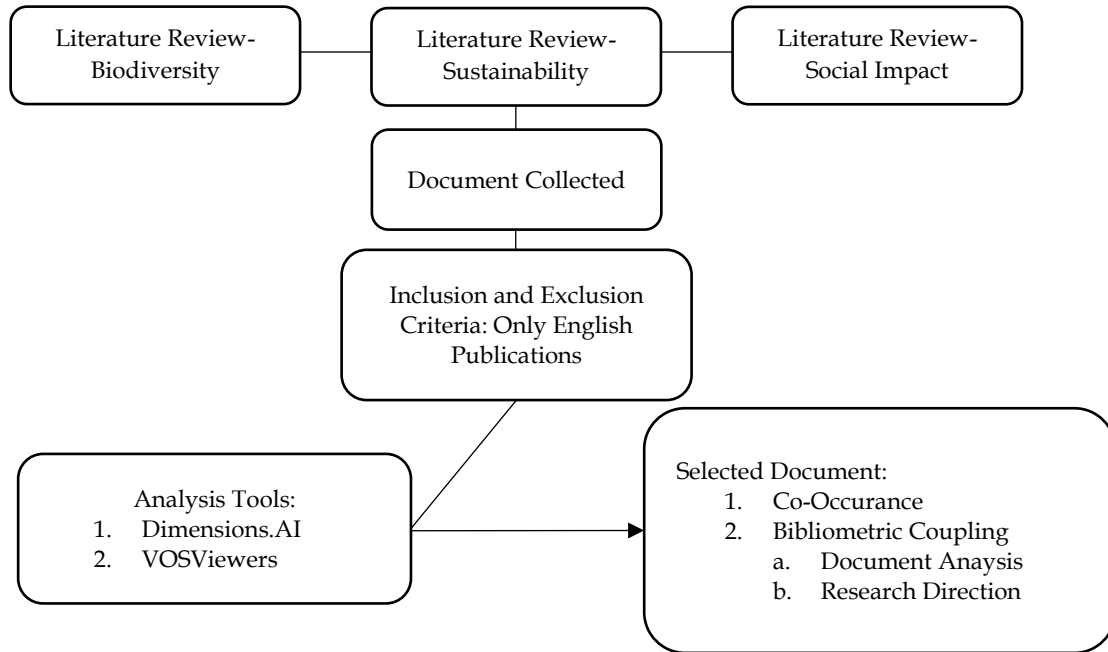


Figure 1. The Research Framework

D. Result & Discussion

Table 3 shows the increasing trend of research publications on the three variables, namely biodiversity, sustainability, and social impact on Islamic finance from 2015-2024. There is a rapid increase in the biodiversity variable in 2023 reaching 124 journal publications, the sustainable variable peaked in total journal publications of 249 in 2024. Finally, the social impact variable had the highest total journal publications in 2023 with a total of 109. Within a period of 9 years, a significant increase occurred after the Covid-19 crisis so that the volume of publications on the three variables already had a high intensity for researchers to discuss aspects of the biodiversity, sustainability, and social impact variables on Islamic finance.

Table 3. Journal Published Total

| Variables | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|----------------|------|------|------|------|------|------|------|------|------|------|
| Biodiversity | 10 | 17 | 35 | 33 | 42 | 58 | 77 | 108 | 124 | 93 |
| Sustainability | 13 | 8 | 23 | 24 | 58 | 51 | 97 | 103 | 176 | 249 |
| Social Impact | 12 | 4 | 14 | 13 | 34 | 28 | 64 | 73 | 109 | 94 |

Based on the database on Dimension.AI, there are international publications from (Kulionis, 2024) on biodiversity finance, namely creating a dual relationship between biodiversity and the financial sector, which is often referred to as "dual materiality". Dual materiality is a new theory developed for sustainability purposes. However, what is new in this study is how the concept of Islamic finance bridges the existence of biodiversity finance with the concept of dual materiality as a sustainable step that certainly has a social impact.

D.1. Co-Occurrence-Biodiversity

The results of co-occurrence analysis were conducted to analyze the relationship between the articles. Previously, researchers did not measure using "Islamic finance" because the relationship between Islamic finance and biodiversity was not directly influenced. In the articles that linked the words "Finance" and "Biodiversity," there were 3 clusters that were repeated 40 times, which found 106 bound words and 64 words identified as related. This research allows for research directions, the following table describes the top five words of the clusters:

Table 4. The Table of Top Five Words In The Co-Occurrence Analysis of Biodiversity

| Name | Keywords |
|-------------------|--|
| Cluster 1 (Red) | Agriculture, business, climate change, economy, environmental |
| Cluster 2 (Green) | Biodiversity conservation, cost, ecosystem, forest, funding |
| Cluster 3 (Blue) | Biodiversity loss, financing, risk, lack, sustainable finance, |

Following the most prominent and recent sentences, here the authors present the most visible initial words, namely, "climate change", "sustainability", "ecosystem", "livelihood", "knowledge", "technology", "environment", "water", "protection", "conservation", "loss", "ecosystem services", "risk", "authentic value", "governance", "concept", "forest", "land", "society" and "health". Co-occurrence analysis is used to investigate the existing or predictable relationships between themes in finance and biodiversity by focusing on the textual content of research articles included in the publication dataset. Author keywords that appear at least forty times in the databases used in this study.

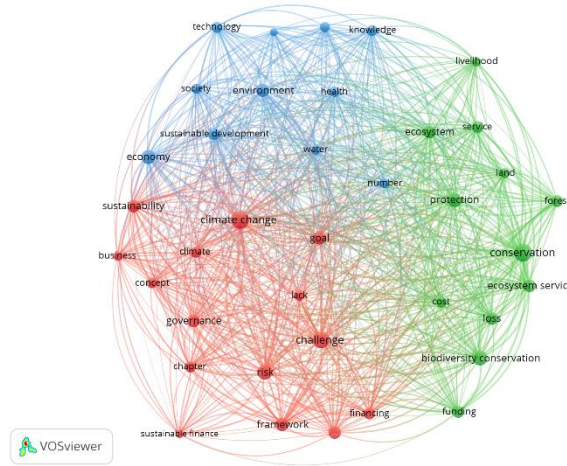


Figure 2. The Result of The Co-Occurrence Analysis of Biodiversity

D.2. Bibliographic Coupling Document-Biodiversity

Bibliographic coupling-document pairs, metadata found from 752 sources found 30 thresholds with 64 articles consisting of 11 clusters and 101 links. The VOSviewer visualization can be seen in the image above. There are 5 research sources with the most links from Dempsey's research (2016) 112 total link strength, Corson (2013) 35 total link strength, Hein (2013) 33 total link strength, Bracking (2012) 27 total link strength. Research from (Dempsey, 2016) explains the gap between ecologists who maintain the development of biodiversity, academics to research the theory of development and economist decision makers by making economics as a driver, thus giving rise to selective conservation of investment power for biodiversity which includes 112 total links. However, for the most citations made by (Waldron et al., 2013) as many as 459 with 22 total link strengths by discussing the level of funding for the development of effective global biodiversity conservation for the United Nations biodiversity targets, so that it has 459 citations as a research trend from biodiversity.

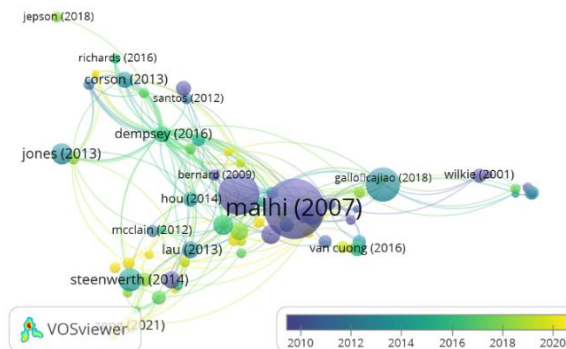


Figure 3. The Result of The Bibliographic Coupling-Document of Biodiversity

D.3. Bibliographic Coupling Countries-Biodiversity

Bibliographic coupling-countries pairs, metadata found from 32 countries found 8 clusters and 423 links. The VOSviewer visualization can be seen in the image below.

From the image above, it can be seen that the country with the most articles published in the 2015-2024 period is the United States (125 articles) followed by the United Kingdom (94 articles), Australia and Germany published the same number of documents (40 articles) and Canada (34 articles). The number of documents, number of citations and total link strength of the top five countries can be seen in this table.

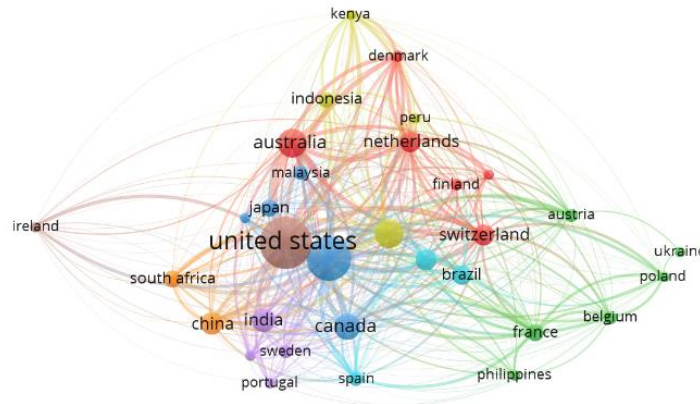


Figure 4 The Result of The Bibliography Coupling-Countries of Biodiversity

Table 5. Table of Five Top Countries in Bibliography Analysis of the Biodiversity

| No. | Countries | Documents | Citations | Total link Strength |
|-----|----------------|-----------|-----------|---------------------|
| 1. | United States | 125 | 5476 | 9964 |
| 2. | United Kingdom | 94 | 4259 | 8653 |
| 3. | Australia | 40 | 1273 | 4957 |
| 4. | Germany | 40 | 755 | 3680 |
| 5. | Canada | 34 | 1213 | 3121 |

D.4. Co-Occurrence-Sustainability

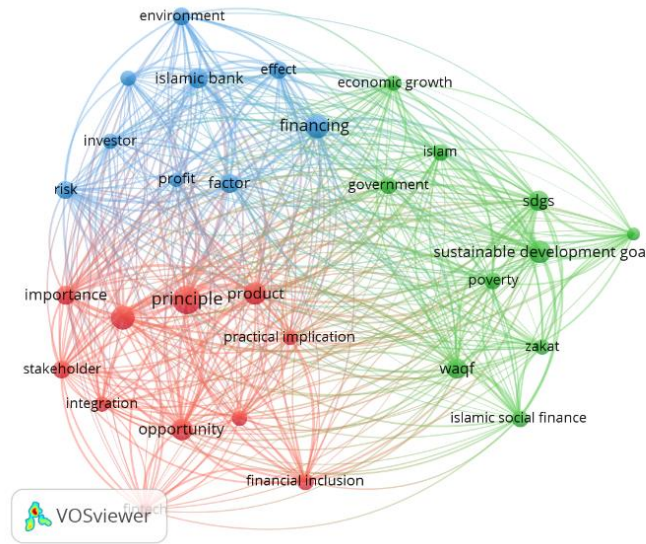


Figure 5. The result of the Co-Occurrence of Sustainability

The results of the Islamic Finance-sustainability in co-occurrence analysis were conducted to analyze the relationship between the articles. In the articles that linked the words “Islamic Finance” and “sustainable,” 3 clusters repeated 50 times, found 99 bound words and 59 words identified as related. This research allows for research directions, the following table describes the top five words of the clusters:

Table 6. The Table of Top Five Words in the Co-Occurrence Analysis of Sustainability

| Name | Keywords |
|--------------------------|---|
| Cluster 1 (Red) | Financial Inclusion, Fintech, Growth, integration, Policymaker. |
| Cluster 2 (Green) | Economy growth, government, Islamic Social Finance, Poverty, SDGs |
| Cluster 3 (Blue) | Environment, Financing, Islamic bank, Profit, Risk |

Following the most prominent and recent sentences, here the author presents the most visible initial words, namely, "product", "principle", "practical implication", "importance", "stakeholders", "integration", "waqf", "zakat", "Islamic social finance", "government", "financing", "Islamic bank", "profit", "investor", and "environment". Cooccurrence analysis is used to investigate the existing or predictable relationships between themes in Islamic finance and sustainability by focusing on the textual content of research articles included in the publication dataset.

D.5. Bibliographic Coupling Document-Sustainability

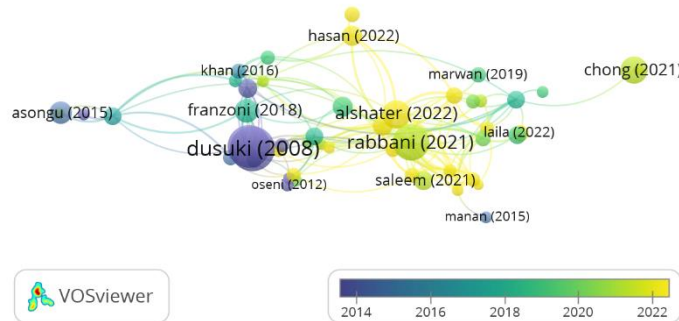


Figure 6. The Result of The Bibliography-Document Analysis of Sustainability

Bibliographic coupling-document pairs, metadata found from 659 sources found 8 thresholds with 101 articles consisting of 11 clusters. The VOSviewer visualization can be seen in the image above, there are 5 research sources with the most links from Rabbani's research (2021) 28 total link strength, Harahap (2023) 25 total link strength, Franzoni (2018) 24 total link strength, Widiastuti (2022) 22 total link strength. Research from (Rabbani et al., 2021) explains that financial technology (Fintech) has provided the missing impetus for the Islamic financial system to compete on an equal footing with its conventional counterparts and prove its mettle. However, for the most citations made by (Wajdi Dusuki, 2008) as many as 149 citations with 14 total link strengths by discussing sustainability from the perspective of Islamic banks, that Islamic banks should not rely solely on financial performance but must have an impact on social responsibility, both stakeholders also care about the impact of Islamic banks on social welfare and Islamic banking practices.

D.6. Bibliometric Countries-Sustainability

Bibliographic coupling-country pairs, metadata found from 21 countries found 5 thresholds with 21 countries consisting of 5 clusters and 203 links. The VOSviewer visualization can be seen in the image below:

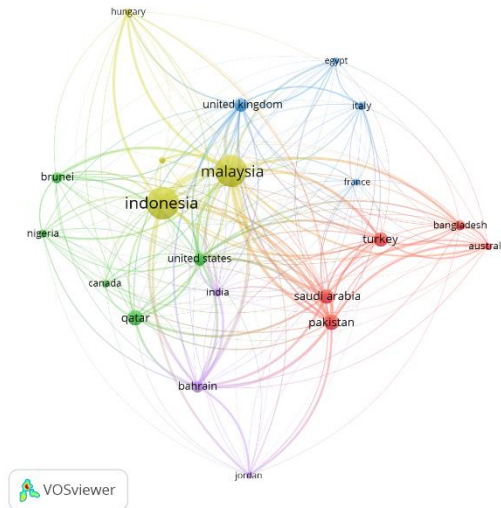


Figure 7. The Result of The Bibliography Analysis-Countries of Sustainability

From the image above, it can be seen that the country with the most published articles in the 2015-2024 period is Indonesia (128 articles) followed by Malaysia (112 articles), Pakistan (27 articles) and Qatar (26 articles). If from the number of documents, the number of citations and the total link strength, the order of the countries can be seen from the following table, the order of the highest total link strength is Malaysia, followed by Indonesia, while the largest number of documents is Indonesia.

Table 7. The Table of Top Five Countries in The Bibliography Analysis of Sustainability

| No. | Country | Documents | Citations | Total Link Strength |
|-----|-----------|-----------|-----------|---------------------|
| 1. | Indonesia | 128 | 311 | 2924 |
| 2. | Malaysia | 112 | 826 | 4341 |
| 3. | Pakistan | 27 | 140 | 1914 |
| 4. | Qatar | 26 | 115 | 801 |
| 5. | Turkey | 24 | 25 | 949 |

D.7. Co-Occurrence-Social Impact

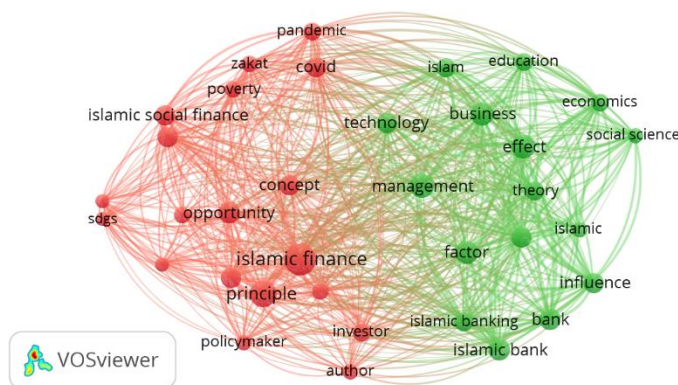


Figure 8. The Result of The Co-Occurrence Analysis of Social Impact

The results of the Co-occurrence Islamic Finance-social impact analysis were conducted to analyze the relationship between articles. Previously, there had been quite a lot of research on the topic between "Islamic finance" and "social impact" with their relationship to biodiversity and sustainability. In the article linking the words "Islamic Finance" and "Social Impact" there were 2 clusters that were repeated 35 times, in which 35 identified words were found related to 593 links. This study allows for research direction, the following table describes 5 words in the top two clusters:

Table 8. The Table of The Top Five Words Co-Occurrence Analysis of The Social Impact

| | |
|--------------------------|---|
| Cluster 1 (Red) | Islamic Finance, Islamic social finance, policymaker, poverty, sdgs |
| Cluster 2 (Green) | Bank, business, economics, education, Islam |

Following the most prominent and recent sentences, here the author presents the most visible initial words, namely, "Pandemic", "covid", "zakat", "poverty", "Islamic social finance", "sdgs", "opportunity", "Islamic finance", "principle", "policy maker", "technology", "business", "education", "Islamic banking", "bank", and "social science". Co-occurrence analysis is used to investigate the existing or predictable relationships between themes in Islamic finance and social impact by focusing on the textual content of research articles included in the publication dataset.

D.8. Bibliographic Coupling Document-Social Impact

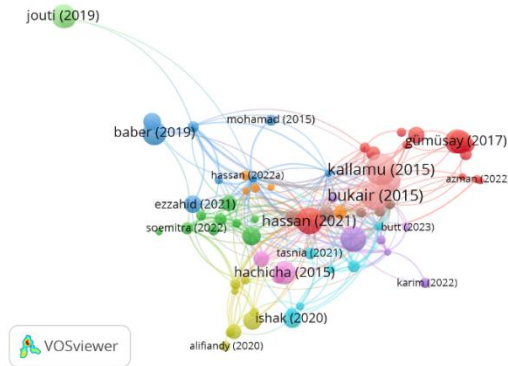


Figure 9. The Result of The Bibliographic Coupling Document of Social Impact

Bibliographic coupling-document pairs, metadata found from 457 sources found 8 thresholds with 93 articles consisting of 11 clusters and 293 links. The VOSviewer visualization can be seen in the image above. From the image above, it can be seen that the 5 research sources with the most links from Hassan's research (2021) 76 total link strength, ahmed (2021) 72 total link strength, boudawara (2023) 50 total link strength, haridan (2018) 42 total link strength. Research from Ma'rif et al., (2021) the Covid-19 pandemic caused an economic contraction where the inability to open a business caused liquidity problems which ultimately led to layoffs of workers to reduce operational costs and some businesses had to close completely so that data analysis shows the importance of Islamic social finance. However, for the most citations made by (Bukair & Abdul Rahman, 2015) as many as 89 citations with 21 total link strengths by discussing the role of banks in controlling zakat as a social transaction, the role of banks is measured by company performance such as CEO, board of directors, and bank size so that there is control of Islamic financial transactions that have an impact on society.

D.9. Bibliography Analysis-Social Impact

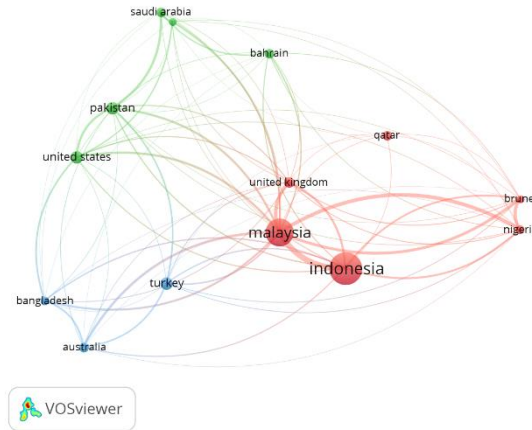


Figure 10. The Result of The Bibliography Coupling Analysis of Social Impact

Bibliographic coupling-Countries pairs, metadata found from 14 countries consists of 3 clusters and 2335 links. The VOSviewer visualization can be seen in this image. It can be seen that the country with the most published articles in the 2015-2024 period is Indonesia (82 articles) followed by Malaysia (60 articles), Pakistan (13 articles) and Turkey (13 articles). If from the number of documents, the number of citations and the total link strength, the order of the countries can be seen from the following table, there is a sequence of the highest total link strength, namely Indonesia.

Table 9. The Table of The Top Five Countries in The Bibliography Analysis of Social Impact

| No. | Countries | Document | Citations | Total Link Strength |
|-----|---------------|----------|-----------|---------------------|
| 1. | Indonesia | 82 | 221 | 731 |
| 2. | Malaysia | 60 | 596 | 1315 |
| 3. | Pakistan | 13 | 133 | 314 |
| 4. | Turkey | 13 | 18 | 152 |
| 5. | United States | 12 | 131 | 260 |

This study presents various aspects of analysis to explain the relationship between published research and literature review analysis sources. Increasing the sustainability of human survival through the development of Islamic finance to achieve the ICD 2027 renewal target and efforts to achieve the SDGs 2030. The results of the bibliometric analysis of the word "financial inclusion" are crucial words that are widely discussed by researchers, so that financial inclusion becomes one of the controllers of solutions related to the relationship between biodiversity and finance (dual materiality). Society cannot live without the environment, and the economy is part of social interaction. This perspective makes community-based conservation a potential approach (Esmail et al., 2023), this social interaction can be overcome by Islamic finance based on social transactions such as zakat and waqf.

In accordance with the results of this research analysis, zakat and waqf become striking words as social transactions towards sustainability, the connectedness of factors from these social transactions becomes a social and ecological poverty trap that will affect the feedback process of social impacts (Yang et al., 2023) on sustainability. So that it can play the role of Islamic finance in bridging efforts to achieve SDGs (Kickbusch & Alakija, 2023). Zakat transactions are able to provide protection for these transactions by ensuring sustainability (Ashurov et al., 2022), and Waqf transactions also play an active role as a sustainability impact program, namely by having benefits for the community. Where in this transaction there is a balance of wealth that must be owned as a servant of Allah SWT (Izzatul Afrina, 2024). Islamic financial instruments that are able to bridge the linkage between biodiversity and sustainability are visible social impacts. This study produces a linkage of benefits to biodiversity, sustainability, and their impacts on social impacts through Islamic finance with social transactions. Finally, countries that focus on biodiversity issues are currently found in Western countries such as the United States, United Kingdom, Germany, etc., but research that focuses on solving sustainability problems and their impact on society is currently in republics and Islamic countries such as Indonesia, Malaysia, Saudi Arabia, Pakistan, and Turkey.

E. Conclusion and Policy Recommendation

This study is able to contribute to provide the ability for further researchers to prove the relationship between Islamic finance and the three variables, namely biodiversity, sustainability and social impact with social transactions. Considering republican countries that have a majority of Muslim society rather than Islamic countries such as in the Middle East countries because to see the real social impact of the three variables and as a megabiodiversity country. The limitations of the study on the article documents for the analysis used only have the criteria of article dimensions so that they lack criteria specifically. and, it is hoped that further research will be able to add to the criteria for research objects. This study produces findings on the relationship between biodiversity, sustainability, and social impact on the role of Islamic finance, but the limitations of the indicators used for each variable, Empirical studies to examine the implications related to each variable will help produce new variables aimed at the social impact on society.

So that, further research is expected to provide innovation in indicators for each variable and can examine these findings, namely that social transactions are a bridge for the role of Islamic finance in dealing with biodiversity, sustainability, and social impact issues towards the country's efforts to achieve the 2030 SDGs program. Further research is expected to examine the biodiversity issue of republican countries and Islamic countries because it is still very minimal to be studied even though there is still a connection between sustainability and social impact.

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