



Mapping the Landscape of Green Waqf Research: A Bibliometric and Systematic Literature Review

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ABSTRACT

Green Waqf represents an innovation in the management of waqf assets that integrates Islamic philanthropic principles with the concept of sustainable development. This study aims to examine the development of green waqf research during the period 2017–2026. The study employs bibliometric analysis using VOSviewer and Publish or Perish (PoP), complemented by a literature review, to examine publication trends, citation patterns, and the thematic development of green waqf research. The findings indicate a marked upward trend in publications, particularly from 2021, reaching a peak in 2025. A total of 307 articles were identified, accumulating 1,061 citations, reflecting growing academic interest in green waqf. The thematic analysis identifies four interconnected research streams: (1) conceptual strategic development of green waqf green waqf, (2) integration of waqf with Islamic financial instruments, particularly sukuk and green sukuk, (3) integration with broader Islamic philanthropic instruments, and (4) institutional governance and innovative financing mechanisms. The density analysis further indicates that sukuk and green waqf constitute the prominent research hotspots, while cash waqf linked remains relatively underexplored. These findings suggest that green waqf research is increasingly positioned at the intersection of sustainable development, Islamic social finance, and financial innovation, while future research should further investigate governance mechanisms, innovative financing structures, and measurable environmental and social impacts.

ABSTRAK

Wakaf hijau (Green Waqf) merupakan inovasi pengelolaan aset wakaf yang mengintegrasikan prinsip filantropi Islam dengan konsep pembangunan berkelanjutan. Penelitian ini bertujuan untuk mengkaji perkembangan penelitian mengenai wakaf hijau selama periode 2017–2026. Penelitian ini menggunakan analisis bibliometrik dengan bantuan VOSviewer dan Publish or Perish (PoP), yang dilengkapi dengan tinjauan literatur, untuk menganalisis tren publikasi, pola sitasi, dan perkembangan tematik penelitian wakaf hijau. Hasil penelitian menunjukkan adanya tren peningkatan publikasi yang cukup kuat, terutama sejak tahun 2021, dengan jumlah publikasi tertinggi pada tahun 2025. Sebanyak 307 artikel teridentifikasi dengan total 1.061 sitasi, yang mencerminkan meningkatnya perhatian akademik terhadap wakaf hijau. Analisis tematik mengidentifikasi empat aliran penelitian yang saling berkaitan, yaitu: (1) pengembangan konseptual dan strategis wakaf hijau, (2) integrasi wakaf dengan instrumen keuangan syariah, khususnya sukuk dan green sukuk, (3) integrasi dengan instrumen filantropi Islam yang lebih luas, dan (4) tata kelola kelembagaan serta inovasi pembiayaan. Density analysis menunjukkan bahwa sukuk dan wakaf hijau merupakan tema penelitian yang menonjol, sedangkan cash waqf linked sukuk masih relatif kurang dieksplorasi. Temuan ini menunjukkan bahwa penelitian wakaf hijau

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semakin berkembang pada keterkaitan antara pembangunan berkelanjutan, keuangan sosial Islam, dan inovasi keuangan, sekaligus menunjukkan peluang penelitian lebih lanjut mengenai mekanisme tata kelola, struktur pembiayaan inovatif, serta pengukuran dampak lingkungan dan sosial.

INTRODUCTION

The changing conditions of the global ecosystem, which have become increasingly difficult to predict, have posed a serious threat to the sustainability of life for both present and future generations (Muthmainnah et al., 2020). The decline in environmental carrying capacity not only impacts ecological stability but also demands development instruments capable of making long-term contributions to environmental balance (Rusydiana et al., 2023). The integration of Islamic economics and religious institutions is viewed as one of the strategic approaches to mitigating climate change more effectively (Sulistiyowati & Holifurrahman, 2025).

Among the various instruments of Islamic economics, waqf represents one of the most promising mechanisms for addressing global environmental challenges. Historically, waqf has served as a sustainable socio-economic development instrument designed to promote public welfare (masalah) (Qurrata et al., 2021; Zauro et al., 2020). The fundamental characteristics of waqf, such as sustainability, resilience, and permanence, demonstrate that waqf assets naturally align with the principles of sustainable development. Consistent with this perspective, Mohsin & Muneeza (2018) have emphasized that the sustainability of waqf management is primarily determined by two key components: the underlying assets (including both real estate and cash endowments) and the quality of managerial governance.

In recent years, waqf has evolved into a broad, complex, and increasingly fragmented field of scholarly inquiry (Qurrata et al., 2021). Some previous studies highlight the socio-economic role of waqf (Anam et al., 2022; Mahsun et al., 2022; Rusydiana et al., 2023; Uluyol et al., 2021), while an increasing number of studies have employed bibliometric approaches to map the intellectual structure and research trends of waqf studies (Alshater et al., 2022; Anam et al., 2022; Gzahli et al., 2022; Uluyol et al., 2021). Nevertheless, studies on the performance and sustainability of waqf institutions remain limited, including how waqf can contribute to environmental issues, climate change, and ecological sustainability. Therefore, the concept of green waqf has begun to emerge as a waqf approach directed toward environmental preservation, climate change mitigation, and sustainable development (Irfany et al., 2023). Green waqf is understood as a mechanism of productive waqf and cash waqf used to support sustainability-based programs, such as sustainable agriculture, nature conservation, and the provision of ecological services (Hasan & Syahrudin, 2022; Ibrahim, 2023). This concept is closely aligned with several Sustainable Development Goals (SDGs) and is increasingly recognized as a promising Islamic social finance instrument for addressing contemporary global challenges (Hasan & Syahrudin, 2022).

At the national policy level, the Indonesian Waqf Board (Badan Wakaf Indonesia, BWI) has launched the National Green Waqf Framework, which affirms the role of waqf in supporting sustainable development. The framework directs the management of waqf assets toward financing environmentally sustainable projects, including energy conservation, waste management, reforestation, and sustainable agriculture. It also promotes the integration of cash waqf, productive waqf, and waqf-linked sukuk as innovative financing instruments to support Indonesia's green economy (Wulansari & Rahmawati, 2025). Furthermore, BWI emphasizes that green waqf can serve as a key catalyst for achieving the Sustainable Development Goals, particularly Goal 13 (Climate Action) and Goal 15 (Life on Land).



Globally, recent studies show that green waqf has developed into an interdisciplinary research field that integrates Islamic philanthropy, asset management, and environmental sustainability. Mohamed & Akande (2025) demonstrate that waqf assets can be strategically mobilized to promote the development of green infrastructure and improve energy efficiency. Similarly, Duasa & Munir (2025) identify several green waqf initiatives in Malaysia and Indonesia that have contributed to the sustainable development agenda, although their implementation continues to face challenges related to governance quality and the measurement of environmental impacts.

Meanwhile, research Saputra (2025) introduces the concept of digital green waqf, which integrates digital transparency, efficient asset management, and sustainability reporting within waqf institutions. The study argues that the digitalization of waqf can strengthen public trust while expanding community participation in environmentally sustainable projects. Nevertheless, Rusydiana et al. (2023) highlight the persistent lack of empirical evidence regarding the measurement of environmental impacts and the development of waqf-based green financing models.

Despite the growing body of literature on green waqf, several important gaps remain. First, existing studies have primarily focused on conceptual discussions, governance issues, and socio-economic contributions, while a comprehensive understanding of the global intellectual structure of green waqf research is still lacking. In particular, there has been no systematic mapping of thematic evolution, collaboration patterns, influential publications, or institutional research networks that have shaped the development of this emerging field. Second, empirical evidence on the implementation models and environmental impacts of green waqf, particularly within the Indonesian context, remains limited. Third, although the Indonesian Waqf Board (BWI) has introduced the National Green Waqf Framework as a strategic policy to promote sustainable development, little empirical research has examined how this policy agenda aligns with the global evolution of green waqf scholarship. Consequently, the current evidence base remains insufficient to support the formulation of evidence-informed policies and strategic directions for the future development of green waqf.

To address these gaps, this study employs a combined Bibliometric Analysis (BA) and Systematic Literature Review (SLR) to provide a comprehensive synthesis of the global green waqf literature published between 2017 and 2026. Specifically, this study aims to (1) map the intellectual structure and publication trends of green waqf research; (2) identify the most influential authors, institutions, countries, and collaboration networks; (3) examine the evolution of research themes and emerging topics; and (4) identify promising research agendas and policy implications for the future development of green waqf. By integrating bibliometric evidence with a systematic review, this study extends the existing literature beyond descriptive analyses and offers a more comprehensive understanding of how green waqf has evolved as an interdisciplinary research domain at the intersection of Islamic social finance, environmental sustainability, and sustainable development. Furthermore, the findings are expected to provide an evidence-based reference for policymakers, practitioners, and researchers, while reinforcing Indonesia's strategic position as a global leader in advancing green Islamic philanthropy (Zain et al., 2024).

RESEARCH METHODOLOGY

This study employs a bibliometric approach to examine the scientific literature on green waqf. Bibliometric analysis is a quantitative research method used to evaluate scientific publications by identifying publication patterns, research trends, and intellectual relationships among authors, institutions, and keywords within a particular field of study (Passas, 2024). To facilitate the analysis,



two bibliometric software packages were employed. Publish or Perish was used to retrieve bibliographic metadata and citation data from the selected publications, while VOSviewer was utilized to construct and visualize bibliometric networks, including co-authorship, institutional collaboration, and keyword co-occurrence. The combined use of these tools provides a comprehensive overview of the global development of green waqf research and its evolving intellectual landscape.

To enhance the rigor of the literature review process, the bibliometric analysis was complemented by the Scientific Procedures and Rationales for Systematic Literature Reviews (SPAR-4-SLR) protocol proposed by Paul et al. (2021). SPAR-4-SLR provides a systematic, transparent, and replicable framework for conducting comprehensive literature reviews. The protocol comprises three sequential stages. The first stage, Assembling, involves identifying and collecting relevant publications from appropriate academic databases. The second stage, Arranging, focuses on screening, selecting, and organizing the retrieved studies according to predefined inclusion and exclusion criteria. The final stage, Assessing, entails a critical evaluation of the selected articles to ensure their methodological quality, relevance, and contribution to the research objectives.

The integration of bibliometric analysis with the SPAR-4-SLR protocol enables this study to provide a more comprehensive review of the existing literature. While bibliometric analysis offers quantitative insights into publication trends, collaboration patterns, and the intellectual structure of green waqf research, the SPAR-4-SLR framework facilitates a systematic and critical evaluation of the selected studies. Consequently, this combined approach not only captures the quantitative evolution of the literature but also provides a deeper understanding of the major research themes, emerging topics, and future directions of green waqf research.

Table 1: SPAR-4-SLR Protocol for Green Waqf Research

Stage	Component	Description
Assembling	Identification	Research domain: Green Waqf Source type: Peer-reviewed journal articles
	Acquisition	Search databases: Google Scholar Search period: 2017–2026 Search keywords: "Green Waqf", "Waqf Hijau"
Arranging	Organization	Bibliographic information organized by citation count, authors, article title, publication year, publisher, and article URL.
	Purification	Population identified: 1,034 Excluded records: 727 Included articles: 307
Assessing	Evaluation	Bibliometric computational mapping using VOSviewer, complemented by a systematic literature review based on the SPAR-4-SLR framework.
	Reporting	Reporting format: Figures, tables, and narrative synthesis. Limitations: Data source coverage and review methodology. Source of support: None.

RESULT AND DISCUSSION

Based on Based on the previously established selection criteria, 1,034 articles were identified as the research population through a Google Scholar search of Publish or Perish (PoP). After the processes of identification, screening, and selection, 307 articles were chosen as the research sample, as presented in figure 1.

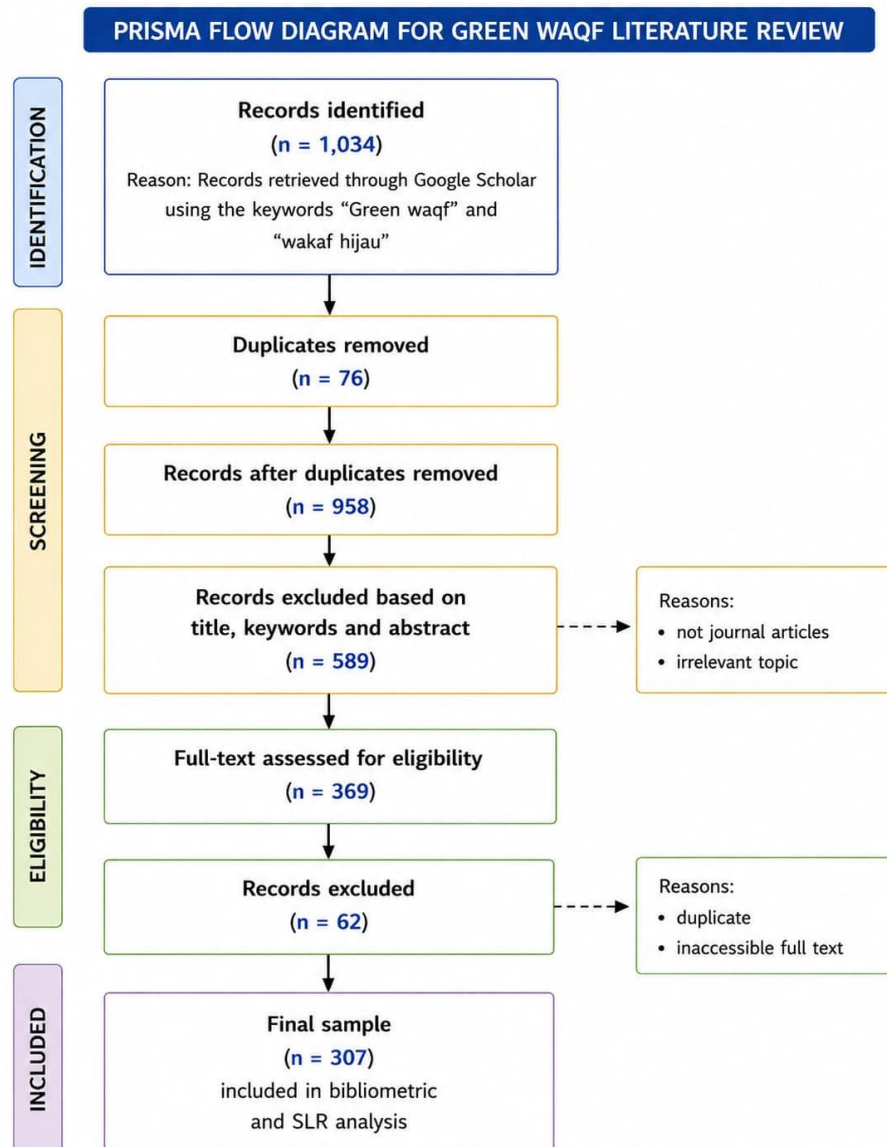


Figure 1: Selection and Purification of Green Waqf Research

Mapping the Distribution of Green Waqf Publications

This study used VOSviewer software to map the bibliometric network of scholarly publications discussing the development of green waqf. Through VOSviewer, a network map visualization was produced to show the relationships among elements such as keywords, publication sources, and authors. The literature data were collected by searching articles through Publish or Perish (PoP), which was connected to the Google Scholar database. The search was conducted using the keywords "Green waqf"



or “wakaf hijau” over the last nine years, covering the period 2017 to 2026. The search results were then saved in RIS file format for subsequent analysis using VOSviewer (Passas, 2024).

Research trends related to green waqf show a very strong upward trajectory from 2021 to 2025, with the highest publication surge occurring in 2025. Overall, the number of published articles increased rapidly compared with the early period of 2017–2019, which was still relatively limited. In terms of citations, the highest citation count was recorded in 2023, indicating that publications from that period had a considerable influence on the development of green waqf studies.

Table 2: Scientific Publication Data on Green Waqf

Year	Number of Articles	Number of Citations	Number of Authors
2017	4	69	33
2018	1	2	6
2019	3	6	12
2020	6	17	36
2021	11	128	57
2022	16	99	105
2023	38	289	213
2024	44	221	252
2025	167	230	1.047
2026	17	0	111
Total	307	1061	1872

One important note: the year 2026 in the table is likely incomplete because the data appear to have been collected early in the year, so citation counts may still change.

Table 2 presents the annual distribution of scientific publications and citation counts on green waqf research over the last nine years (2017–2026). The publication trend provides an overview of the evolution of scholarly interest in this emerging field, while citation counts reflect the academic influence and visibility of the published studies. To illustrate these trends more clearly, the annual distribution of publications is presented in Figure 2:

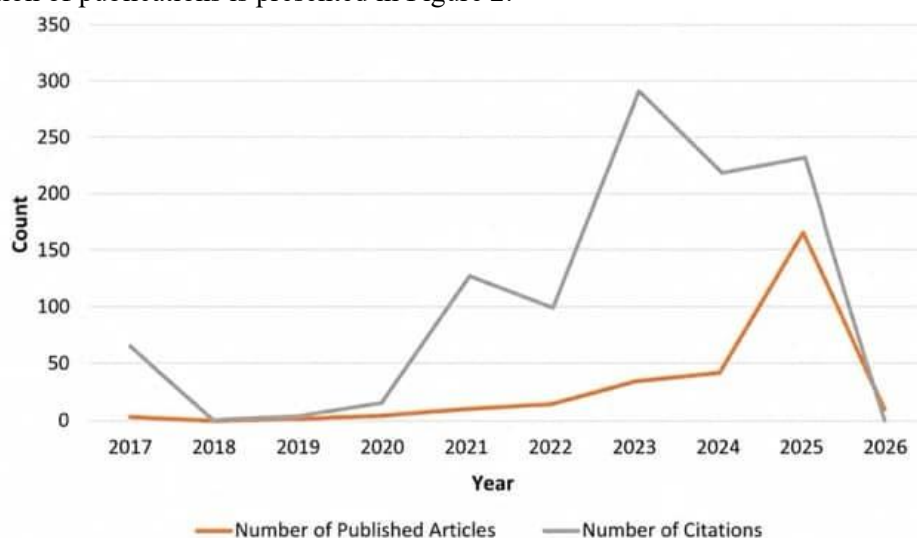


Figure 2: Graph of the Distribution of Scientific Publications on Green Waqf



Based on the data presented in Table 2, the development of green waqf research demonstrates a highly dynamic pattern in terms of publication output, citation performance, and author participation. During the initial period (2017–2019), scholarly output remained relatively limited. In 2017, only four publications were identified; however, these articles accumulated a total of 69 citations and involved 33 authors. Despite the relatively small number of publications, the high citation count suggests that the pioneering studies on green waqf made substantial scholarly contributions and served as important references for subsequent research. In contrast, publication activity remained relatively stagnant in 2018 and 2019, with only one and three articles published, respectively, accompanied by relatively low citation counts. This pattern indicates that green waqf research was still in its exploratory stage, with limited scholarly engagement and a relatively narrow research scope.

A more consistent upward trend emerged during the period from 2020 to 2022. In 2020, the number of publications increased to six articles, attracting 17 citations and involving 36 authors, indicating a growing academic interest in the topic. This positive trend continued in 2021, when publication output rose to 11 articles and citations increased substantially to 128, with contributions from 57 authors. The sharp increase in citations reflects the growing recognition and relevance of green waqf within the academic community. In 2022, publication output further expanded to 16 articles, accompanied by 99 citations and 105 authors. Although the citation count was slightly lower than that of the previous year, the considerable increase in the number of contributing authors suggests that collaborative research on green waqf was becoming more prevalent, in line with the expanding discourse on sustainability and green finance within Islamic economics.

The most remarkable growth occurred between 2023 and 2025. In 2023, publication output increased sharply to 38 articles, generating 289 citations and involving 213 authors. This substantial growth indicates that green waqf has become an increasingly important and strategically relevant research theme, particularly in relation to the integration of Islamic endowment with environmental sustainability initiatives. The upward trajectory continued in 2024, with 44 publications, 221 citations, and participation from 252 authors. The highest level of research activity was recorded in 2025, when publication output increased dramatically to 167 articles, involving 1,047 authors and generating 230 citations. The remarkable increase in the number of authors reflects the expansion of collaborative research networks across institutions and countries, highlighting the growing international interest in green waqf. Although the citation count in 2025 did not increase proportionally with publication output, this finding is expected because most of the publications are relatively recent and have not yet had sufficient time to accumulate citations.

In 2026, publication output declined to 17 articles, with no citations recorded at the time of data collection and a total of 111 contributing authors. This decline should be interpreted with caution, as the data collection period did not encompass the entire calendar year. Consequently, the number of indexed publications and citations for 2026 is likely to underestimate the actual research output for that year. This finding shows that the publication trend between 2017 and 2026 reveals a substantial expansion of green waqf research, particularly from 2021 onward, culminating in a significant surge in 2025. This trajectory demonstrates the increasing recognition of green waqf as an important and emerging research field at the intersection of Islamic social finance, environmental sustainability, and sustainable development. The rapid growth in publication output, author participation, and collaborative research further suggests that green waqf has evolved from a niche research topic into a vibrant interdisciplinary field with growing academic and policy relevance.

The rapid expansion of green waqf research after 2021 coincides with the growing global emphasis on sustainable finance, ESG implementation, climate change mitigation, and the increasing recognition of Islamic social finance as a complementary mechanism for achieving the Sustainable Development Goals (SDGs). This trend is consistent with previous studies (Hasan & Syahrudin, 2022; Mohamed & Akande, 2025) and with the policy direction outlined in the Indonesian Waqf Board's Green Waqf Framework (BWI, 2022), which emphasize that green waqf has evolved beyond a traditional philanthropic instrument into an innovative financing mechanism capable of supporting environmental conservation and sustainable development initiatives. The substantial increase in international collaboration also suggests that green waqf is gaining wider scholarly recognition as an interdisciplinary research domain integrating Islamic economics, environmental governance, and sustainability science.

Bibliometric Mapping of Green Waqf Research Based on Keyword Co-occurrence

The bibliographic records retrieved using Publish or Perish were exported in Research Information Systems (RIS) format and subsequently imported into VOSviewer for bibliometric analysis. Using keyword co-occurrence analysis, VOSviewer generated a network visualization illustrating the conceptual structure and thematic relationships within the green waqf literature. The resulting co-word network reveals the evolution of research themes and classifies the literature into four major thematic clusters, as presented in Figure 3.

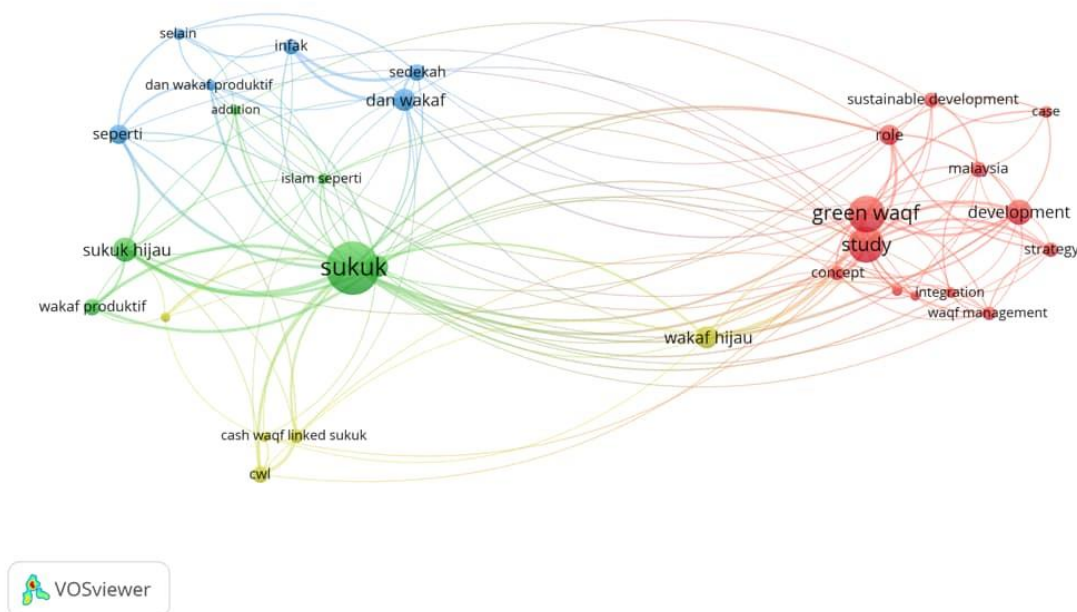


Figure 3: Network Visualization of Keyword Co-occurrence in Green Waqf Research

The network visualization generated by VOSviewer demonstrates that the green waqf literature is organized into four interconnected thematic clusters, each representing a distinct research focus. Table 3 summarizes the keywords contained within each cluster, together with their occurrence



frequency and total link strength, which indicate both the prevalence of a keyword in the literature and the strength of its relationships with other keywords within the research network.

Table 3: Keyword Clusters in Green Waqf Research

No.	Cluster	Keyword	Total Link Strength	Occurrences
1	Cluster 1	concept	21	9
2		development	30	21
3		green waqf	55	39
4		implementation	11	5
5		integration	11	6
6		malaysia	13	10
7		role	27	16
8		strategy	17	19
9		study	54	37
10		sustainable development	10	9
11		waqf land	8	6
12		waqf management	16	8
13	Cluster 2	islam	12	6
14		productive waqf	66	29
15		sukuk	105	69
16	Cluster 3	sukuk hijau	37	20
17		wakaf produktif	20	16
18		infak	22	10
19	Cluster 4	sedekah	22	11
20		BWI	8	5
21		cash waqf linked	37	19

The bibliometric analysis identified 21 keywords that met the relevance threshold and were grouped into four thematic clusters. A higher total link strength indicates that a keyword is more strongly connected with other topics within the bibliometric network, reflecting its centrality and influence in shaping the intellectual structure of the research field. This clustering demonstrates that green waqf research has evolved along multiple interconnected dimensions, encompassing conceptual development, Islamic financial instruments, Islamic philanthropy, and institutional governance. Among these themes, green waqf emerges as a central research topic, closely linked to sustainability and environmental development.

Cluster 1: Conceptual and Strategic Development of Green Waqf

Cluster 1 (red) comprises twelve keywords: concept, development, green waqf, implementation, integration, Malaysia, role, strategy, study, sustainable development, waqf land, and waqf management. This cluster represents the conceptual and strategic foundation of green waqf research, particularly concerning its implementation within the broader context of sustainable development. The relatively high occurrence and total link strength of green waqf indicate its central position within this thematic cluster and reflect the growing attention to environmental sustainability in contemporary waqf research.

The co-occurrence of keywords such as concept, development, implementation, strategy, waqf management, and sustainable development suggests that scholarly attention has extended beyond



defining green waqf toward exploring how the concept can be implemented and integrated into sustainable waqf management. The presence of waqf land further indicates interest in the sustainable utilization of waqf assets as part of this development. Meanwhile, Malaysia appears as an important geographical context in the literature, particularly in discussions related to implementation, strategy, and sustainable waqf management.

This cluster contributes to the development of green waqf research by establishing its conceptual and operational foundation. It reflects a gradual shift in scholarly perspectives from viewing waqf primarily as a traditional socio-economic and philanthropic instrument toward recognizing its potential role in addressing environmental sustainability and broader sustainable development objectives.

Cluster 2: Green Waqf-Islamic Financial Instrument Integration

Cluster 2 (green) consists of four keywords: Islam, productive waqf, sukuk, and green sukuk. This cluster represents the integration of green waqf with Islamic financial instruments, highlighting the convergence between Islamic social finance and sustainable finance. Among the keywords, sukuk exhibits the highest occurrence and total link strength, indicating its dominant position and strong connectedness within this thematic cluster. The presence of green sukuk further reinforces the sustainability dimension of this financial integration.

The association among productive waqf, sukuk, and green sukuk suggests that green waqf is increasingly examined not as an isolated philanthropic concept but as part of a broader sustainable Islamic financial architecture. This thematic development indicates growing scholarly interest in how waqf can be connected with Islamic capital market instruments to support productive and sustainability-oriented activities.

This cluster contributes to the development of green waqf research by extending the discussion from sustainable waqf management toward innovative financing mechanisms. In this context, green waqf is increasingly positioned at the intersection of Islamic social finance, Islamic capital markets, and sustainable development, demonstrating its potential to function not only as an asset-management mechanism but also as part of a broader framework for financing sustainability-oriented initiatives.

Cluster 3: Green Waqf within the Islamic Philanthropic Ecosystem

Cluster 3 (blue) comprises three keywords: wakaf produktif (productive waqf), infaq, and sadaqah. This cluster represents the ecosystem dimension of green waqf research, highlighting the relationship between waqf and other Islamic philanthropic instruments. The co-occurrence of productive waqf with infaq and sadaqah indicates that waqf is increasingly examined within the broader Islamic social finance and philanthropic ecosystem, rather than as an independent instrument.

This interconnected perspective suggests that green waqf may be considered alongside complementary Islamic philanthropic instruments in pursuing social and sustainable development objectives. Rather than focusing solely on the environmental function of individual waqf assets, this research stream broadens the discussion toward the potential integration of different Islamic social finance instruments.

This cluster contributes to the development of green waqf research by introducing a broader ecosystem perspective, in which green waqf can be understood as part of an interconnected Islamic social finance system. Although this thematic stream is relatively smaller than the financial integration stream, it provides an avenue for further research on how waqf, infaq, and sadaqah can potentially complement one another in supporting social and environmental sustainability.



Cluster 4: Institutional Governance and Innovative Waqf Financing

Cluster 4 (yellow) consists of two keywords: BWI (Badan Wakaf Indonesia/ Indonesian Waqf Board) and cash waqf linked. This cluster highlights the institutional and financing innovation dimension of green waqf research. The presence of BWI reflects the relevance of institutional actors in waqf development and governance, while cash waqf linked represents an emerging financing innovation that connects cash waqf with Islamic financial products. Such mechanisms may broaden the capacity of waqf to support sustainable development projects, including environmental initiatives.

The combination of these keywords suggests that the development of green waqf requires not only conceptual and financial innovation but also institutional arrangements that facilitate the mobilization and management of waqf resources. The emergence of cash waqf linked therefore indicates a movement toward exploring alternative mechanisms through which waqf resources can be mobilized for productive and sustainability-oriented purposes.

This cluster contributes to the development of green waqf research by bringing attention to institutional governance and innovative financing mechanisms. Compared with the more established themes surrounding green waqf and sukuk, this dimension provides an emerging avenue for research concerning institutional design, financing structures, and the practical mobilization of waqf resources for sustainable development.

The four thematic clusters reveal that green waqf research has become increasingly multidisciplinary and interconnected. Rather than focusing exclusively on the traditional functions of waqf, recent studies have expanded toward issues of sustainable development, Islamic financial innovation, and institutional governance. The central position of green waqf within the keyword network indicates that it has evolved into a prominent research theme that bridges Islamic social finance with environmental sustainability. This evolution reflects a broader transformation in the scholarly understanding of waqf, from a conventional charitable institution to an innovative instrument capable of supporting sustainable development and addressing contemporary environmental challenges.

Based on the keyword network visualization, the largest nodes represent the most frequently occurring keywords within the green waqf literature, including sukuk, green waqf, study, and productive waqf. The size of each node reflects the frequency with which a keyword appears in the dataset, whereas the links connecting the nodes indicate the strength of thematic relationships among the keywords within the research network. Consequently, larger nodes with stronger interconnections represent the dominant themes shaping the intellectual structure of green waqf research. To further examine the relative prominence of these research themes, a density visualization was generated using VOSviewer, as presented in Figure 4.

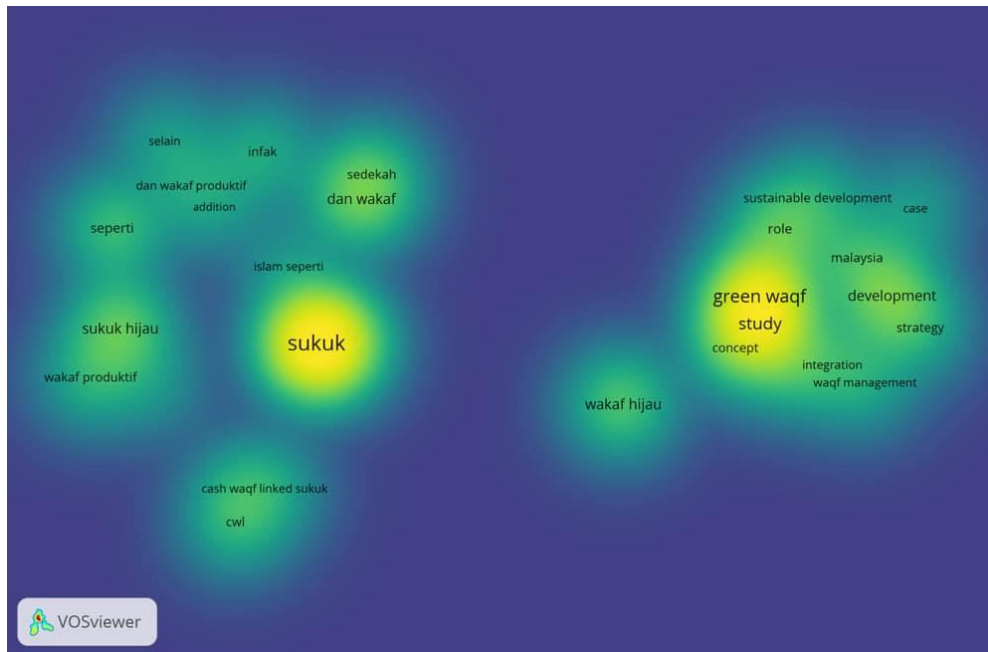


Figure 4: Density Visualization of Green Waqf Research

The density visualization provides a clearer representation of the thematic concentration within the green waqf literature, as illustrated in Figure 3. In this visualization, keywords displayed in brighter colours represent topics with higher occurrence frequencies and stronger connections within the bibliometric network, indicating areas that have attracted substantial scholarly attention. Conversely, darker-coloured keywords denote themes that have received comparatively less attention and remain less developed in the existing literature.

Based on the density map, *sukuk*, *green waqf*, *study*, and *development* appear in the brightest areas, indicating that these topics constitute the principal research hotspots within the green waqf literature. The central position of *green waqf*, together with its close association with keywords such as *sustainable development*, *waqf management*, *integration*, and *strategy*, suggests that the concept has gradually evolved beyond its traditional philanthropic role and is increasingly positioned within the broader discourse of sustainable development. This pattern reflects the growing recognition of green waqf as an Islamic social finance instrument capable of supporting environmental sustainability and achieving broader socio-economic objectives.

The visualization also reveals a strong thematic relationship between *green waqf* and *sukuk*. Among all keywords, *sukuk* exhibits the highest density, indicating that the integration of waqf with Islamic capital market instruments has become one of the dominant research streams in the field. Furthermore, the appearance of keywords such as *green sukuk* and *cash waqf linked sukuk* highlights an emerging trend toward developing innovative Islamic financial instruments that support environmentally sustainable investment projects. These findings suggest that recent studies have increasingly explored the convergence of Islamic social finance and sustainable finance rather than examining waqf as an isolated philanthropic institution.

In contrast, several keywords, including *wakaf hijau*, *infaq*, *sadaqah*, and other related concepts, appear in relatively less dense areas of the visualization. Their lower density indicates that these topics have received comparatively limited scholarly attention and remain underexplored within the current



body of literature. This pattern is particularly relevant because it indicates that the development of green waqf research has not occurred evenly across all thematic dimensions. While conceptual discussions and Islamic financial integration have attracted considerable attention, issues related to philanthropic integration and innovative financing mechanisms remain comparatively underexplored.

To facilitate interpretation, the keywords were further classified according to their relative density levels, as presented in Table 4.

Table 4: Classification of Green Waqf Research Themes Based on Keyword Density

No	Density Category	Keywords
1	Very High Density	Sukuk, Green Waqf, Study
2	High Density	Development, Role, Sustainable Development, Malaysia, Concept, Integration, Waqf Management
3	Moderate Density	Wakaf Hijau, Productive Waqf, Green Sukuk, Infaq, Sadaqah
4	Low Density	Cash Waqf Linked

As shown in Table 4, the green waqf literature can be categorized into four thematic groups according to keyword density. The very high-density category is dominated by sukuk, green waqf, and study, indicating that the existing literature primarily concentrates on conceptual discussions and the integration of waqf with Islamic financial instruments. The high-density category encompasses themes related to sustainable development, institutional management, and strategic implementation, suggesting that researchers have increasingly examined green waqf from governance and sustainability perspectives. Meanwhile, the moderate-density category comprises topics associated with Islamic philanthropy, including productive waqf, green sukuk, infaq, and sadaqah, reflecting a growing interest in integrating various Islamic social finance instruments. Finally, cash waqf linked appears as the only keyword within the low-density category, indicating that this area remains relatively underexplored and offers considerable opportunities for future research, particularly regarding innovative financing mechanisms that integrate waqf with sustainable investment initiatives.

An important finding from the density analysis is that sukuk exhibits higher density than green waqf, indicating that Islamic financial innovation has become a prominent context in the development of green waqf research. Together with the high density of green waqf and development, this pattern suggests that the literature has established a relatively strong conceptual and financial foundation, particularly around the integration of green waqf with sustainable Islamic finance.

However, the uneven density distribution also indicates that several dimensions remain relatively underexplored. The lower density of infaq, sadaqah, productive waqf, and particularly cash waqf linked suggests that research has progressed further in conceptualizing green waqf and its financial integration than in examining its practical implementation, integration with other Islamic social finance instruments, innovative financing mechanisms, and measurable sustainability outcomes. Thus, the density analysis complements the cluster analysis by identifying not only dominant research themes but also areas where the literature remains less developed.

These findings provide several directions for future research. First, empirical studies are needed to examine the implementation and management of green waqf across different institutional and geographical contexts. Second, further research could develop and evaluate waqf sukuk and waqf green sukuk financing models, including their governance and financial feasibility. Third, greater attention



could be given to the integration of green waqf with infaq and sadaqah within the Islamic social finance ecosystem. Finally, the low density of cash waqf linked highlights an emerging opportunity to investigate innovative financing mechanisms and their environmental, social, and economic impacts.

The density analysis indicates that green waqf research is moving from conceptual development toward sustainable Islamic financial integration, while empirical implementation, financing innovation, social finance integration, and impact assessment remain promising areas for further development.

Analysis of Research Developments Regarding Green Waqf

The literature indicates that the concept of green waqf has evolved considerably over the past two decades in response to growing global concerns regarding climate change, environmental sustainability, and the increasing demand for sustainable financing mechanisms. As an emerging form of Islamic social finance, green waqf integrates the spiritual values of waqf with environmentally responsible practices to support sustainable development and strengthen socio-ecological resilience (Rusydiana et al., 2023).

Mohsin & Muneeza (2018) and Zauro et al. (2020) emphasize that the core principles of waqf that is sustainability, public welfare, and asset continuity aligned naturally with the concept of sustainable development. Meanwhile, Wulansari & Rahmawati (2025) explain that the Indonesian Waqf Board (BWI) has introduced the Green Waqf Framework to encourage the allocation of productive waqf assets toward environmentally beneficial activities, including renewable energy, sustainable agriculture, and waste management. At the global level, Duasa & Munir (2025) report that the implementation of green waqf in Indonesia and Malaysia has contributed to sustainable development initiatives, although challenges remain regarding governance effectiveness and environmental impact assessment. Similarly, Mohamed & Akande (2025) emphasize the potential of productive waqf assets to finance green infrastructure projects, including energy-efficient buildings and sustainable water management systems.

Digital governance innovation has also become a focus of recent research. Saputra (2025) introduced the digital green waqf concept which integrates transparency and technology-based reporting to strengthen public trust. This view shows that the success of green waqf in the modern era is greatly influenced by technological readiness and institutional governance. Furthermore, Faizi, et al. (2024) show that the integration of Islamic green finance and green waqf can accelerate the achievement of the Sustainable Development Goals (SDGs), especially Goal 13 (climate action) and Goal 15 (life on land). They argue that both instruments share the same ethical principles: social justice, collective responsibility, and environmental preservation. Likewise, Rusydiana et al., (2023) emphasize the importance of integrating green sukuk and waqf-based investment to build a complementary ecosystem of Islamic sustainable finance.

The findings of the present bibliometric analysis are broadly consistent with these developments in the literature. The prominence of keywords such as green waqf, sukuk, sustainable development, and waqf management in the keyword co-occurrence and density analyses indicates that contemporary research has increasingly positioned green waqf within the broader discourse of sustainable Islamic finance. Rather than treating waqf solely as a traditional philanthropic institution, recent studies have expanded its role toward financing environmentally sustainable projects, strengthening institutional governance, and supporting climate-related initiatives.

From the results of the literature review, it can be concluded that green waqf has a strategic role in supporting sustainable development and climate change mitigation through Islamic social finance instruments. This concept shows that waqf assets not only function socially, but also as financial



instruments capable of encouraging green investment and environmental conservation projects. Aam & Muhammad (2022) emphasizes that a sharia-based green economy is the foundation of a fair, ethical and sustainable financial system. However, most of the literature is still conceptual and descriptive. Empirical studies on environmental impact evaluation and governance models are still limited (Rusydiana et al., 2023). Other challenges include a lack of standardized measurements of ecological impacts, a lack of international collaboration, and a disconnect between academic research and public policy.

CONCLUSION

The growth in the number of publications on green waqf in the Google Scholar database from 2017 to 2026 shows a highly significant upward trend, particularly from 2021 onward, with publication activity reaching its peak in 2025. Overall, 307 publications were analyzed, generating 1,061 citations and involving 1,872 authors. This increasing scholarly attention reflects the growing relevance of green waqf within broader discussions of sustainability, Islamic social finance, and the green economy.

The keyword co-occurrence analysis identifies four interconnected thematic clusters that characterize the development of green waqf research. The first focuses on the conceptual and strategic development of green waqf, particularly its relationship with sustainable development, waqf management, and implementation. The second emphasizes green waqf Islamic financial instrument integration, with sukuk and green sukuk emerging as prominent themes. The third reflects green waqf within the broader Islamic philanthropic ecosystem, particularly through its relationship with infaq and sadaqah. The fourth highlights institutional governance and innovative waqf financing, including the emerging theme of cash waqf linked. These clusters demonstrate that green waqf research has expanded beyond its traditional philanthropic orientation toward sustainability, financial innovation, and institutional development.

The density analysis further indicates that research attention is concentrated around green waqf, sukuk, and development, suggesting that the field has established a relatively strong conceptual and financial foundation. However, the relatively lower density of themes such as infaq, sadaqah, productive waqf, and particularly cash waqf linked indicates that the development of the literature remains uneven. The findings therefore suggest that green waqf research has progressed further in conceptualizing the instrument and exploring its integration with sustainable Islamic finance than in providing empirical evidence concerning its implementation, innovative financing mechanisms, integration with other Islamic social finance instruments, and measurable environmental and socio-economic impacts.

Accordingly, future research should move toward empirical and impact-oriented studies that examine the implementation and governance of green waqf across different institutional and geographical contexts. Further attention is also needed to develop and evaluate waqf-sukuk and waqf-green sukuk financing models, explore the integration of green waqf with other Islamic social finance instruments, and investigate innovative mechanisms such as cash waqf linked. Strengthening environmental, social, and economic impact measurement will also be important to provide evidence of the actual contribution of green waqf to sustainable development. Last but not least, the future development of the field should move from predominantly conceptual and associative research toward empirically validated models of implementation, financing, governance, and sustainability impact.



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