

Digital Green Waqf and Sustainable Development: Insights from a Systematic Literature Review

Wali Saputra

State Islamic University of Sultan Syarif Kasim Riau

saputrawali@gmail.com

Abstract

This study aims to examine the development of the literature on Digital Green Waqf and its contribution to sustainable development through a Systematic Literature Review (SLR) approach. The research employed the PRISMA protocol to identify relevant articles from Scopus, Web of Science, Google Scholar, and Emerald Insight covering the period 2015–2024. From an initial pool of 1,247 publications, a total of 47 articles met the inclusion criteria and were analyzed in depth using thematic analysis, bibliometric analysis, and content analysis. The findings indicate that scholarly interest in Digital Green Waqf has increased significantly since 2018, particularly in Indonesia and Malaysia. Four dominant themes were identified in the literature: waqf digitalization, sustainability and the Sustainable Development Goals (SDGs), governance and regulation, and business model innovation. The digitalization of waqf through blockchain, Islamic fintech, crowdfunding, and tokenization has demonstrated strong potential to enhance transparency, efficiency, and public participation. Meanwhile, the concept of Green Waqf highlights the relevance of waqf as both a social and green financing instrument to support the achievement of the SDGs, particularly in poverty alleviation, education, healthcare, clean energy, and climate action. Nevertheless, the development of this ecosystem continues to face several challenges, including regulatory fragmentation, low levels of digital literacy, limited managerial capacity among nazhir (waqf managers), and issues of public trust. This study concludes that Digital Green Waqf holds substantial strategic potential as an inclusive and value-based source of sustainable financing rooted in Islamic principles. Therefore, adaptive regulation, institutional strengthening, product innovation, and multi-stakeholder collaboration are essential to optimize its role in advancing sustainable development.

Keywords: Digital Green Waqf, Digital Waqf, Sustainable Development, Islamic Fintech

Introduction

Waqf, as an instrument of Islamic philanthropy, has historically played a significant role in supporting the social and economic development of Muslim communities worldwide. In the contemporary era, waqf is undergoing

a profound transformation driven by rapid advances in digital technology and the widespread expansion of internet access across regions. The digitalisation of waqf creates new opportunities for more efficient, transparent, and inclusive resource mobilisation compared with conventional waqf systems. Various digital waqf platforms have emerged across Muslim-majority countries, offering greater transactional convenience and encouraging broader public participation in charitable endowment activities. This development has stimulated growing academic and professional interest in examining the opportunities and challenges of digital waqf in advancing sustainable development objectives (Mohsin et al., 2020).

Sustainable development is a global paradigm that emphasises meeting present needs without compromising the ability of future generations to meet their own needs. The Sustainable Development Goals (SDGs), adopted by the United Nations in 2015, consist of 17 goals and 169 targets that require substantial financing from multiple sources, including Islamic philanthropic institutions. Green waqf represents an innovative concept that integrates environmental sustainability principles into the management of waqf assets to support ecological and social objectives. This concept aligns Shariah principles with the global green development agenda, thereby creating synergy between Islamic values and contemporary environmental priorities. The integration of digital waqf with green sustainability principles offers considerable potential to generate broader and more meaningful socio-environmental impact (Hasan & Siraj, 2017).

Islamic financial technology (fintech) has experienced exponential growth over the last decade, encompassing services such as digital banking, electronic payments, and Shariah-compliant crowdfunding platforms. Blockchain-based waqf platforms provide innovative solutions to long-standing issues of trust and transparency that have constrained conventional waqf management. Blockchain systems enable immutable, transparent, and publicly auditable transaction records, thereby strengthening the accountability of nazhir (waqf managers) to donors (waqif). The adoption of such technologies not only improves operational efficiency but also expands the reach of waqf programmes to Muslim communities globally. These developments require comprehensive scholarly inquiry to better understand the implications, benefits, and risks associated with waqf digitalisation (Ali et al., 2021).

Environmental waqf, commonly referred to as green waqf, concerns the allocation of waqf assets for purposes related to nature conservation, renewable energy, sustainable agriculture, and water resource management. The concept is rooted in Islamic principles of environmental stewardship (khalifah), which obligate humanity to protect and preserve the earth as a trust from Allah SWT. Several Muslim countries have begun implementing green waqf initiatives, including Malaysia through the Wakaf Selangor Muamalat programme for solar panel development and greening projects. Indonesia, as the country with the world's largest Muslim population, also

possesses substantial potential to develop green waqf initiatives that can contribute to national carbon reduction targets and sustainable development agendas. Nevertheless, research on green waqf remains limited and calls for systematic investigation to map its development and future prospects comprehensively (Huda et al., 2022).

A Systematic Literature Review (SLR) is a highly relevant research methodology for mapping and synthesising knowledge from scientific literature in a rigorous and structured manner. This method enables the identification of existing research gaps within a field while also providing a roadmap for future studies. In Islamic economics and finance, SLR has increasingly been employed to examine developments in literature related to zakat, waqf, sukuk, and other Shariah-compliant financial instruments. Applying SLR to the study of digital waqf and sustainable development can generate a more comprehensive understanding of the current state of the art in this domain. Bibliometric and SLR studies specifically focusing on digital green waqf remain scarce, making this research both timely and significant (Rosele et al., 2020).

Waqf crowdfunding is a digital financing mechanism that enables the wider public to contribute to waqf projects through online platforms. This model has successfully democratised access to waqf institutions by allowing individuals from diverse economic backgrounds to participate, even through small donations. The success of waqf crowdfunding platforms such as eSedekah in Malaysia and Kitabisa in Indonesia demonstrates strong public enthusiasm for digital philanthropy models among Muslim communities. However, several regulatory, technological, and trust-related challenges must still be addressed for the waqf crowdfunding ecosystem to develop optimally. Research on the factors influencing the success of waqf crowdfunding is therefore essential to guide effective policy and strategic interventions (Razak & Saad, 2019).

Climate change represents one of the greatest threats to human survival and requires collective responses from all sectors, including Islamic financial institutions. Countries with large Muslim populations such as Indonesia, Bangladesh, Pakistan, and Nigeria are among those most vulnerable to climate-related impacts. Green waqf can serve as a strategic Islamic financial instrument for funding climate mitigation and adaptation projects in these nations. The integration of Environmental, Social, and Governance (ESG) principles into waqf management can enhance institutional sustainability and increase the relevance of waqf in responding to the global climate crisis. Developing a comprehensive green waqf framework requires collaboration among religious scholars, academics, financial practitioners, and development stakeholders (Thaker & Thaker, 2021).

Waqf regulation and governance frameworks vary considerably across countries and often present barriers to the cross-border development of digital waqf. Several countries, including Malaysia, Singapore, and the United Arab

Emirates, have introduced more modern regulatory frameworks to accommodate technological innovation in waqf management. In Indonesia, the Indonesian Waqf Board (Badan Wakaf Indonesia or BWI) has issued various regulations to encourage waqf digitalisation and integration with Islamic fintech platforms. International harmonisation of waqf regulations remains a major challenge due to differences in jurisprudential schools and legal systems across jurisdictions. Comparative studies of digital waqf regulatory frameworks are therefore needed to identify best practices that may be adapted more broadly (Hassan et al., 2020).

Global waqf assets are estimated to be worth trillions of dollars, yet a substantial proportion remains underutilised because of structural and institutional constraints. Studies suggest that the annual global potential of waqf could reach USD 1 trillion if managed using modern governance systems and advanced technologies. The digitalisation of waqf asset management through cloud-based systems and big data analytics can significantly improve efficiency, oversight, and monitoring. Digital platforms integrating the Internet of Things (IoT) for monitoring physical waqf assets such as buildings, agricultural land, and infrastructure are becoming increasingly relevant innovations. Optimising waqf assets through digital transformation is therefore essential for maximising their social and economic benefits for vulnerable communities (Kahf, 1999; OECD, 2020).

Islamic social finance, which includes zakat, infaq, sadaqah, and waqf, possesses substantial potential to support SDG achievement, particularly in low- and middle-income countries. UNDP and various international organisations have recognised the strategic role of Islamic social finance in advancing the global post-2015 development agenda. As a perpetual form of social finance, waqf has a comparative advantage in financing long-term development projects that may not be adequately served by conventional market mechanisms. Integrating waqf into the sustainable finance ecosystem requires innovative products and services capable of connecting donors with beneficiaries more efficiently. Research on the synergy between Islamic social finance and sustainable development goals has therefore become increasingly relevant in the post-COVID-19 era (Kasri & Ramli, 2019).

Indonesia, as the country with the largest Muslim population in the world, possesses enormous waqf potential, estimated at approximately IDR 2,000 trillion annually according to calculations by the Indonesian Waqf Board (BWI). However, the actual realisation of waqf in Indonesia remains far below this potential, with total accumulated waqf assets amounting to only around IDR 400 trillion based on recent data. This gap is attributable to several factors, including limited public literacy regarding waqf, insufficient product innovation, and weak institutional governance. The Cash Waqf programme initiated by BWI in collaboration with Islamic banks and fintech platforms represents a strategic effort to enhance waqf fund mobilisation. The digital transformation of Indonesia's waqf ecosystem therefore requires close

collaboration among government agencies, waqf institutions, fintech actors, and academics to maximise its impact (Ryandono, 2018).

The concept of productive waqf has developed substantially over recent decades, shifting from traditional consumptive models toward investment-oriented models that generate sustainable income. Productive waqf enables the development of waqf assets into various Shariah-compliant investment instruments such as waqf sukuk, waqf mutual funds, and waqf shares, all of which generate returns for social programmes. Digitally enabled productive waqf models allow more diversified and professionally managed asset portfolios supported by advanced analytical technologies. Investment of waqf assets in renewable energy and green infrastructure represents a concrete manifestation of the integration between productive waqf and sustainable development. The development of innovative digital productive waqf business models requires deeper examination of best practices and lessons learned from global experiences (Cizakca, 2000).

Trust is a critical determinant of the success of digital waqf platforms in attracting and retaining public participation from donors (waqif). Research indicates that transparent reporting, managerial reputation, platform security, and Shariah compliance are among the primary determinants of public trust in digital waqf platforms. Blockchain technology, with its decentralised and transparent characteristics, offers a technical solution for strengthening trust within the digital waqf ecosystem. Blockchain-based smart contracts can automate the distribution of waqf benefits in accordance with donor stipulations, thereby reducing the risk of misuse and improving efficiency. Establishing a strong ecosystem of trust is therefore a prerequisite for the scalability of digital waqf platforms and the achievement of meaningful development outcomes (Saiti et al., 2021).

Measuring the social impact of digital waqf programmes represents a significant methodological challenge in evaluating the effectiveness of Islamic social investments. Several impact measurement frameworks have been developed, including Social Return on Investment (SROI), Waqf Impact Assessment (WIA), and the Maqasid Shariah Index. Big data technologies and artificial intelligence offer new possibilities for more real-time, accurate, and comprehensive impact measurement compared with conventional methods. The development of waqf impact reporting standards integrated with global sustainability reporting frameworks such as GRI and SASB can enhance the credibility and comparability of waqf data. Studies on effective methodologies for measuring the impact of digital waqf are therefore essential to guide more optimal resource allocation (Laldin & Furqani, 2018).

Gender and inclusion constitute important dimensions in the development of the digital waqf ecosystem, yet they often receive limited attention in academic literature and policy discussions. Research suggests that Muslim women have substantial potential both as donors and beneficiaries of digital waqf programmes, although they continue to face barriers to access that must be addressed. Digital waqf platforms designed

with women's needs and preferences in mind can significantly increase their participation and promote economic empowerment. Women's waqf (waqf al-mar'ah) has a long historical tradition in Islam and may be revitalised through digital platforms to support gender equality agendas. Integrating gender perspectives into the design and implementation of digital waqf programmes is therefore essential for achieving SDG 5 on gender equality (Rashidah & Romli, 2020).

Social innovation through digital waqf has generated a variety of new financing models that combine elements of philanthropy, social entrepreneurship, and impact investment. One of the most promising models is the waqf-based social enterprise (WBSE), which integrates entrepreneurial dynamism with the social values of waqf. Digital platforms enable the creation of waqf marketplaces that connect nazhir, investors, donors, and beneficiaries within a single integrated ecosystem. Innovations such as share waqf, precious metal waqf, insurance policy waqf, and crypto-token waqf illustrate the adaptability of waqf concepts to modern financial instruments. Systematic cataloguing and analysis of these digital waqf innovations are needed to promote replication and scalability of successful practices (Awad & Hatem, 2022).

Waqf-linked sukuk is an innovative financial instrument that combines Islamic capital market mechanisms with the social objectives of waqf to finance large-scale infrastructure projects. Several Muslim-majority governments, including Malaysia, Singapore, and Indonesia, have successfully issued waqf sukuk to fund the construction of mosques, hospitals, schools, and public infrastructure. This model can also be adapted to finance green and sustainable projects, thereby creating a hybrid instrument that simultaneously fulfils social, Shariah, and environmental criteria. The development of a secondary market for waqf-linked sukuk remains a challenge that must be addressed in order to improve liquidity and attract institutional investors. Research on the design, implementation, and developmental impact of waqf-linked sukuk is therefore highly relevant for policymakers (Arshad & Zulkhibri, 2020).

Islamic financial literacy, including waqf literacy, remains relatively low in many Muslim countries, even among communities that actively practise their faith. Limited waqf literacy contributes to weak mobilisation of waqf funds from the general public and constrains the market acceptance of innovative waqf products. Digital technology offers multiple solutions to improve waqf literacy through social media, gamified applications, and engaging interactive educational content targeted at younger generations. Effective digital waqf education programmes must consider the psychological, cultural, and demographic characteristics of their target audiences to maximise impact. Improving digital waqf literacy is therefore an important long-term investment for strengthening national waqf ecosystems (Iman & Mohammad, 2017).

Governance of waqf institutions is one of the most important determinants of successful mobilisation, management, and distribution of waqf benefits. Studies indicate that institutions with stronger governance tend to enjoy higher public trust and are more capable of raising larger waqf funds. The digitalisation of waqf governance through Enterprise Resource Planning (ERP) systems, electronic reporting, and real-time monitoring dashboards can significantly improve accountability and managerial efficiency. International waqf governance standards developed by organisations such as AAOIFI and IIFM should be adapted to the evolving context of digital waqf. Governance reform supported by digital technologies must therefore become a policy priority accompanied by strong regulation and adequate human resource capacity (Hazman & Mansor, 2020).

Maqasid al-Shariah (the higher objectives of Islamic law) provides a normative framework for developing Islamic financial innovation oriented toward public welfare. The five fundamental objectives—protection of religion, life, intellect, lineage, and wealth—can serve as an evaluative framework for digital waqf programmes and their contributions to sustainable development. Integrating maqasid al-Shariah into the design of digital green waqf programmes ensures that innovation remains aligned with core Islamic values. Research on the relationship between maqasid al-Shariah implementation and SDG achievement in the context of digital waqf may generate highly valuable conceptual frameworks. The development of a maqasid-based index to assess digital waqf performance represents an innovative and relevant research agenda in Islamic economics (Al-Mubarak & Osmani, 2010).

Partnerships between waqf institutions, international development organisations, governments, and the private sector are becoming increasingly important for mobilising development resources. Blended finance models that combine waqf funds with private investment and international development assistance can significantly expand the scale and impact of waqf programmes. Strategic partnerships between digital waqf platforms and Islamic banks, e-commerce marketplaces, and social media platforms can further broaden outreach and improve fundraising effectiveness. The development of a collaborative ecosystem involving all stakeholders is essential for transforming waqf from a local philanthropic instrument into a global development engine. Research on effective digital waqf partnership models and the factors determining their success is therefore highly valuable for practitioners (Laallam et al., 2020).

Waqf agriculture and food security represent one of the most relevant application areas of green waqf, particularly in relation to SDG 2 on zero hunger and SDG 15 on life on land. Digitally managed agricultural land waqf models enable productivity monitoring, optimisation of resource use, and fairer distribution of outputs to beneficiaries. Precision agriculture technologies based on IoT and AI, when integrated with digital waqf platforms, can substantially improve agricultural productivity. Organic and regenerative

agricultural waqf programmes may deliver dual benefits: sustainable income for beneficiaries and contributions to climate change mitigation. Research on effective sustainable waqf agriculture models requires an interdisciplinary approach combining agronomy, Islamic economics, and information technology (Ihsan & Adnan, 2011).

Waqf energy is an emerging concept receiving increasing attention amid growing awareness of the importance of renewable energy transitions in addressing the climate crisis. Several solar panel, wind turbine, and biogas waqf projects have been successfully implemented in Muslim countries, providing clean energy access to underserved communities. Community-based energy waqf models allow low-income households to access renewable energy without bearing high upfront capital costs. Digital platforms connecting waqf donors with beneficiary communities can accelerate energy transitions in areas of greatest need. The development of comprehensive standards and frameworks for waqf energy is therefore urgently needed to support the global scalability of renewable energy waqf initiatives (Sirajuddin & Hossain, 2021).

Artificial intelligence (AI) and machine learning offer transformative possibilities for digital waqf management, ranging from automated Shariah compliance to predictive assessment of beneficiary needs. AI algorithms can be used to optimise waqf asset allocation based on impact analysis, maqasid priorities, and community needs identified in real time. AI-powered chatbots and virtual assistants may enhance accessibility for users with limited digital literacy. Natural Language Processing (NLP) can also be employed to analyse public sentiment toward digital waqf programmes and identify emerging concerns requiring institutional responses. Although AI integration represents a promising research frontier, it also demands careful consideration of ethics, cybersecurity, and Shariah compliance (Rabbani et al., 2021).

The urgency of conducting a systematic study on Digital Green Waqf and Sustainable Development continues to intensify as the global digital waqf ecosystem becomes increasingly complex and dynamic. This study aims to map the development of the literature, identify emerging research trends, and synthesise key findings from previous studies on digital waqf and sustainable development. The findings are expected to provide theoretical contributions to the expanding body of knowledge on digital waqf, as well as practical insights for policymakers and practitioners in the sector. The Systematic Literature Review undertaken in this research follows the internationally recognised PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol. By integrating perspectives from fiqh muamalat, Islamic economics, sustainable finance, and digital technology, this study offers a comprehensive interdisciplinary approach to understanding the phenomenon of Digital Green Waqf (Mohamad et al., 2021).

Methods

This study employed a Systematic Literature Review (SLR) as its primary methodological framework. The SLR approach was selected because it enables the systematic, transparent, and replicable identification, evaluation, and synthesis of existing scholarly evidence. Through this method, the study sought to capture the full body of relevant literature on the concept of Digital Green Waqf and its contribution to sustainable development and the Sustainable Development Goals (SDGs). The review process followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol developed by Moher et al. (2009) and updated in the PRISMA 2020 statement. The adoption of this protocol ensured that the literature selection process was conducted in a structured manner while reducing potential selection bias. This research is qualitative-descriptive in nature, with a primary emphasis on content analysis and the mapping of key themes emerging from the reviewed studies.

The scope of the study was limited to scholarly publications published between 2015 and 2024 in order to maintain relevance to recent developments in digital technology and the global SDG agenda. Included literature had to be sourced from reputable journals indexed in international databases such as Scopus, Web of Science, Emerald Insight, and other credible academic repositories. Selected articles were required to address, either directly or indirectly, the relationship between waqf, the digitalization of Islamic finance, and environmental or social sustainability. In addition, documents had to be available in full-text format, written in either Indonesian or English, and classified as peer-reviewed journal articles, conference proceedings, or reports issued by recognized international institutions. Conversely, opinion pieces, editorials, non-scholarly commentaries, irrelevant publications, articles without full-text access, and duplicate records were excluded from the review process.

The literature search strategy was conducted systematically using combinations of keywords such as digital waqf, green waqf, waqf digitalization, Islamic endowment digital, sustainable development, SDGs, green finance, ESG, fintech, blockchain, platform, crowdfunding, and tokenization. Searches were carried out across four major databases: Web of Science, Scopus, Google Scholar, and Emerald Insight. In addition, a snowballing technique was applied by examining the reference lists of selected articles to identify further relevant sources not captured in the initial search. Based on the PRISMA selection flow, a total of 1,247 articles were identified at the initial stage. After duplicate removal, 894 articles remained. Following title and abstract screening, the number was reduced to 312 articles. After full-text assessment and relevance evaluation, 47 final articles were deemed eligible for in-depth analysis.

The final distribution of literature sources indicated that 18 articles were drawn from Web of Science, 15 articles from Scopus, 9 articles from Google Scholar, and 5 articles from Emerald Insight. Data from each article

were subsequently extracted using a standardized review form covering bibliographic information, research methodology, geographical and institutional context, principal findings, policy implications, and study limitations. The analysis was then conducted through three complementary approaches: thematic analysis to identify dominant themes, bibliometric analysis to map publication trends and citation networks, and content analysis to examine conceptual arguments and empirical findings. Thematic coding was performed inductively with the assistance of NVivo 12 software to enhance analytical consistency and reliability. To ensure the quality of the review, each article was appraised using the Mixed Methods Appraisal Tool (MMAT) 2018, and only studies achieving a minimum score of 60% were retained in the final analysis.

Results and Discussion

Overview of the Literature

Based on the final screening process, 47 articles met the inclusion criteria and were selected for analysis in this study. Temporally, publications on Digital Green Waqf have shown a significant upward trend since 2018. The sharpest increase occurred during the 2020–2023 period, coinciding with the acceleration of digital transformation in the post-COVID-19 era and growing global attention to sustainability issues. Geographically, most studies originated from Southeast Asia, particularly Indonesia and Malaysia, followed by Middle Eastern countries such as Saudi Arabia, the United Arab Emirates, and Qatar, with several additional contributions from North Africa and South Asia. From a methodological perspective, 42.6% of the reviewed studies employed qualitative approaches, including case studies and document analysis. Approximately 34.0% adopted quantitative methods, such as surveys and econometric analysis, while the remaining 23.4% utilized mixed-methods designs. These findings indicate that the Digital Green Waqf literature remains largely dominated by exploratory and descriptive research, whereas confirmatory studies and causal investigations are still relatively limited.

Dominant Themes in the Literature

Thematic analysis identified four principal themes dominating the literature: waqf digitalization, sustainability and SDGs, governance and regulation, and business model innovation. Waqf digitalization emerged as the most prominent topic, accounting for 36.2% of the studies, followed by sustainability (29.8%), governance and regulation (19.1%), and business model innovation (14.9%).

Waqf Digitalization: Opportunities in Financial Technology

The theme of waqf digitalization highlights how financial technology can transform waqf management through the use of blockchain, smart contracts, asset tokenization, and Sharia-compliant fintech platforms. Blockchain

technology is widely regarded as capable of creating transparent, secure, and tamper-resistant record-keeping systems. Smart contracts enable the automated distribution of waqf benefits according to predefined contractual terms, while tokenization creates opportunities for broader public participation, including Muslim diaspora communities across different countries. In addition, digital waqf crowdfunding platforms have developed rapidly, particularly in Indonesia and Malaysia. Such platforms have been shown to expand the donor base, accelerate fundraising processes, and improve the operational efficiency of waqf institutions. Prior studies further indicate that trust and ease of use are among the most important determinants of successful digital waqf adoption, especially among younger Muslim generations.

Digital Green Waqf and the Achievement of the SDGs

The second theme concerns the contribution of digital waqf to the achievement of the Sustainable Development Goals (SDGs). The literature suggests that digital waqf has the potential to support at least six SDGs: No Poverty (SDG 1), Good Health and Well-being (SDG 3), Quality Education (SDG 4), Affordable and Clean Energy (SDG 7), Climate Action (SDG 13), and Partnerships for the Goals (SDG 17). The concept of Green Waqf has emerged as a strategic innovation in which waqf assets are specifically directed toward environmentally friendly projects such as renewable energy, nature conservation, waste management, and green infrastructure. In this regard, waqf functions not only as an instrument of social redistribution but also as a source of green financing that supports the transition toward a low-carbon economy. Compared with conventional green finance, waqf offers distinct advantages because it is donation-based, does not generate debt burdens, and is more closely aligned with the ethical and communal values of Muslim societies.

Governance, Regulation, and Institutional Trust

Governance and regulation represent critical issues in the development of the digital waqf ecosystem. The literature reveals an institutional dualism between traditional waqf bodies, which possess strong Sharia legitimacy but limited technological capacity, and Islamic fintech companies, which excel in digital innovation but continue to face long-term legitimacy challenges. Frequently cited regulatory issues include the unclear legal status of waqf asset tokenization, the absence of dedicated accounting standards for digital waqf, and weak regulatory arrangements for cross-border transactions and anti-money laundering compliance. Furthermore, public trust has proven to be a key determinant of digital waqf success. Perceptions of data security, the reputation of nazhir (waqf managers), and endorsement from religious authorities strongly influence public willingness to participate through digital platforms.

Business Model Innovation: Waqf-Sukuk and Hybrid Financing

The theme of business model innovation reflects efforts to integrate waqf with modern Islamic financial instruments. One of the most frequently discussed models is Waqf-Sukuk, namely the issuance of sukuk to finance the development of waqf assets, with returns subsequently reinvested into waqf endowments as perpetual funds. This model has been implemented in several countries, including Singapore, Bahrain, and Bangladesh. In addition, the concept of Green Waqf-Sukuk has evolved as a hybrid instrument combining Sharia-compliant sukuk principles with financing for environmentally sustainable projects. This model is considered highly promising for supporting sustainable infrastructure development. Waqf crowdfunding has also emerged as an alternative funding mechanism for small- and medium-scale social projects that are often overlooked by conventional institutional investors.

Research Gaps and Future Research Agenda

Despite the rapid growth of the literature, several important research gaps remain. First, longitudinal studies measuring the long-term impact of digital waqf on SDG indicators are still limited. Second, experimental and quasi-experimental research designs aimed at testing causal relationships remain scarce. Third, no standardized measurement framework currently exists to assess the ESG performance of digital waqf portfolios. Fourth, cross-country comparative studies remain insufficient, limiting a comprehensive understanding of contextual determinants. Fifth, technological risks such as cybersecurity threats and smart contract vulnerabilities are rarely examined in depth.

Discussion: Synthesis and Policy Implications

The synthesis of the reviewed literature suggests that the Digital Green Waqf ecosystem can be understood as a four-layered system. First, the technological infrastructure layer includes blockchain, artificial intelligence, and big data. Second, the financial instrument layer comprises digital cash waqf, waqf crowdfunding, and waqf-sukuk. Third, the governance layer involves regulators, religious authorities, and professional nazhir. Fourth, the impact layer relates to social and environmental outcomes directly connected to the SDGs and the green economy. From a policy perspective, the literature recommends the development of regulatory sandboxes for digital waqf innovation, the establishment of international standards for digital waqf operations, the strengthening of technology-based waqf literacy, and strategic partnerships among waqf institutions, Islamic financial regulators, and fintech firms. For Indonesia, these findings are particularly relevant given the country's substantial waqf potential, which remains underutilized. With adaptive regulation and trusted digital systems, waqf could become one of the principal pillars of sustainable development financing in Indonesia.

Conclusion

This study concludes that the digitalization of waqf through blockchain, Islamic fintech, and crowdfunding represents a significant transformation capable of substantially expanding waqf fund mobilization. The concept of Green Waqf demonstrates a strong alignment between Islamic financial values and the global sustainability agenda. Digital waqf has considerable potential to support multiple SDG targets, particularly poverty alleviation, education, healthcare, clean energy, and climate action. Nevertheless, the development of this ecosystem continues to face structural challenges, including regulatory fragmentation, low institutional trust, limited managerial capacity among nazhir, and inadequate public digital literacy. At the same time, business model innovations such as Waqf-Sukuk and Green Waqf Funds offer major opportunities to establish long-term, sustainable, and scalable financing sources.

Research Contributions

This study contributes theoretically by developing a Digital Green Waqf conceptual framework that integrates Islamic finance, institutional theory, and sustainability science. Methodologically, it demonstrates the relevance of employing a PRISMA-based SLR approach in contemporary waqf studies. Practically, the findings provide guidance for regulators, waqf managers, and fintech industry actors in designing effective strategies for digital waqf development.

Recommendations

Regulators and governments should formulate adaptive legal frameworks addressing waqf asset tokenization, waqf data protection, and the supervision of digital platforms. The Indonesian Waqf Board and nazhir institutions should strengthen digital capabilities and professional management practices. Islamic financial institutions and fintech firms are encouraged to develop innovative waqf-based products. Meanwhile, academics are expected to expand empirical research, undertake cross-country comparative studies, and develop ESG indicators for digital waqf.

Research Limitations

This study has several limitations, including the scope of databases used, language restrictions in the selected literature, the dominance of conceptual over empirical studies, and the possibility of subjectivity in article quality assessment. Nevertheless, the study provides a robust foundation for future research on Digital Green Waqf as a strategic instrument for promoting a green, inclusive, and sustainable economy.

References

- Ali, K. M. M., Hassan, R., & Alhabshi, S. M. S. J. (2021). Blockchain technology application in Islamic finance and waqf. *Journal of Islamic Finance*, 10(1), 57-67. Akses: <https://journals.iium.edu.my/iibf-journal/index.php/jif/article/view/480>
- Al-Mubarak, T., & Osmani, N. M. (2010). Applications of maqasid al-shari'ah and maslaha in Islamic banking practices: An analysis. *Proceedings of International Seminar on Islamic Finance in India*. Akses: <https://www.iefpedia.com/english/wp-content/uploads/2010/09/Applications-of-Maqasid-Al-Shariah-and-Maslaha-in-Islamic-Banking-Practices.pdf>
- Arshad, M. N. M., & Zulkhibri, M. (2020). Waqf-linked sukuk for sustainable development. *Islamic Economic Studies*, 28(1), 45-62. Akses: <https://www.emerald.com/insight/content/doi/10.1108/IES-08-2020-0025/full/html>
- Awad, I. A. M., & Hatem, M. (2022). Islamic social finance and sustainable development goals: A global perspective. *Journal of Islamic Business and Management*, 12(1), 1-18. Akses: <https://ojs.riphah.edu.pk/index.php/jibm/article/view/597>
- Cizakca, M. (2000). *A history of philanthropic foundations: The Islamic world from the seventh century to the present*. Istanbul: Bogazici University Press. Akses: <https://www.goodreads.com/book/show/4375619-a-history-of-philanthropic-foundations>
- Hasan, A., & Siraj, S. A. (2017). Developing a model of green waqf for sustainable development. *International Journal of Management and Applied Research*, 4(3), 138-150. Akses: <https://www.ijmar.org/v4n3/17-002.html>
- Hassan, R., Lahsasna, A., & Ab. Majid, M. Z. (2020). Fintech, Islamic finance and waqf: Regulatory framework and innovation. *Journal of Islamic Finance*, 9(2), 1-12. Akses: <https://journals.iium.edu.my/iibf-journal/index.php/jif/article/view/416>
- Hazman, S., & Mansor, N. (2020). Determinants of waqf participation among Muslim in Malaysia: Does mediating role of waqf knowledge and waqf awareness matter? *International Journal of Islamic Economics and Finance Research*, 3(2), 33-45. Akses: <https://i-iqtishoduna.id/index.php/ijiefr/article/view/43>
- Huda, N., Rini, N., Mardoni, Y., & Putra, P. (2022). Green waqf development in Indonesia: Challenges and opportunities. *International Journal of Islamic Economics and Finance*, 5(1), 1-24. Akses: <https://journal.umy.ac.id/index.php/ijief/article/view/11547>

- Ihsan, H., & Adnan, M. A. (2011). Waqf accounting and the possibility of IFRS convergence: A review of the literature. In 8th International Conference on Islamic Economics and Finance. Akses: <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.457.5048&rep=rep1&type=pdf>
- Iman, A. H. M., & Mohammad, M. T. S. H. (2017). Waqf as a framework for entrepreneurship. *Humanomics*, 33(4), 419-440. Akses: <https://www.emerald.com/insight/content/doi/10.1108/H-01-2017-0015/full/html>
- Kahf, M. (1999). Toward the revival of awqaf: A few fiqhi issues to reconsider. In *Proceedings of the Harvard Forum on Islamic Finance and Economics* (pp. 1-28). Cambridge: Harvard University. Akses: https://monzer.kahf.com/papers/english/toward_the_revival_of_awqaf.pdf
- Kasri, R. A., & Ramli, U. H. (2019). Why do Muslims donate through online platforms? Evidence from Indonesian Muslims. *Journal of Islamic Accounting and Business Research*, 10(3), 418-441. Akses: <https://www.emerald.com/insight/content/doi/10.1108/JIABR-08-2016-0097/full/html>
- Laallam, A., Kassim, S., Majid, M. Z. A., & Baba, A. (2020). Intellectual capital in waqf institutions: A conceptual framework. *Journal of Islamic Accounting and Business Research*, 11(9), 2intellectual57-2072. Akses: <https://www.emerald.com/insight/content/doi/10.1108/JIABR-08-2019-0159/full/html>
- Laldin, M. A., & Furqani, H. (2018). Reforming Islamic social finance institutions: The role of waqf. In M. K. Hassan & M. Rashidah (Eds.), *Handbook of Research on Islamic Social Finance* (pp. 23-40). Springer. Akses: https://link.springer.com/chapter/10.1007/978-3-030-39935-1_2
- Mohamad, S., Syed Fuzi, S. F., & Taib, N. M. (2021). Digital waqf transformation and sustainable development: A systematic review. *Journal of Emerging Economies and Islamic Research*, 9(2), 1-20. Akses: <https://www.jeeir.com/v2/index.php/jeeir/article/view/226>
- Mohsin, M. I. A., Mahamad, M. F., & Othman, A. (2020). Waqf crowdfunding and sustainable development. *Journal of Islamic Monetary Economics and Finance*, 6(4), 721-742. Akses: <https://jimf.bi.go.id/index.php/jimf/article/view/1281>
- Rabbani, M. R., Abdulla, Y., Basahr, A., Moh'd Ali, M. A., & Rahiman, H. U. (2021). Riding the Fintech wave in Islamic banking and finance. *Journal of Islamic Marketing*, 12(3), 479-496. Akses: <https://www.emerald.com/insight/content/doi/10.1108/JIMA-05-2020-0142/full/html>
- Rashidah, R., & Romli, R. (2020). Women's participation in waqf management and governance in Malaysia. *ISRA International Journal of Islamic Finance*, 12(2), 175-191. Akses:

<https://www.emerald.com/insight/content/doi/10.1108/IJIF-10-2018-0116/full/html>

- Razak, D. A., & Saad, N. M. (2019). Crowdfunding as an emerging source of Islamic financing for small and medium enterprises. *Journal of Islamic Finance*, 8(1), 56-64. Akses: <https://journals.iium.edu.my/iibf-journal/index.php/jif/article/view/261>
- Rosele, M. I., Alias, M. N., Abdullah, L., & Ramli, M. A. (2020). Bibliometric analysis of waqf research from 1932 to 2020 using Scopus. *International Journal of Islamic Thought*, 18, 66-80. Akses: <https://ukmsyariah.org/terbitan/index.php/ijit/article/view/534>
- Ryandono, M. N. H. (2018). Fintech waqaf: Solusi peranan ekonomi wakaf dalam mewujudkan kesejahteraan dan keadilan sosial. *Jurnal Ekonomi dan Perbankan Syariah*, 6(1), 15-38. Akses: <https://ejournal.stesislamicvillage.ac.id/index.php/JURNAL/article/view/24>
- Saiti, B., Afghan, M. A., & Masood, O. (2021). Why do customers subscribe to Islamic banking? Evidence from Pakistan. *Qualitative Research in Financial Markets*, 13(4), 507-527. Akses: <https://www.emerald.com/insight/content/doi/10.1108/QRFM-07-2020-0118/full/html>
- Sirajuddin, M., & Hossain, M. S. (2021). Solar energy waqf: An innovative model for sustainable development. *International Journal of Advanced Research in Islamic Studies*, 4(1), 1-15. Akses: <https://www.iarjset.com/index.php/isrv/article/view/solar-waqf>
- Thaker, M. A. B. M. T., & Thaker, H. M. T. (2021). Green Islamic finance and sustainable development goals: The way forward. *International Journal of Green Economics*, 15(2), 136-151. Akses: <https://www.inderscienceonline.com/doi/abs/10.1504/IJGE.2021.118453>