

The Evolution of Digital Green Waqf: A Systematic Literature Review on Its Role in Environmental and Social Sustainability

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Abstract

This study aims to examine the development of the Digital Green Waqf concept and its role in supporting environmental and social sustainability through a Systematic Literature Review (SLR) based on the PRISMA guidelines. The study analyzes 47 articles published between 2010 and 2024, retrieved from Scopus, Web of Science, and Google Scholar databases. The findings reveal that the evolution of Digital Green Waqf unfolds across three main phases: administrative digitalization (2010–2015), crowdfunding platform development (2016–2019), and the integration of green waqf with blockchain technology (2020–2024). The results indicate that Digital Green Waqf makes significant contributions to environmental sustainability through financing nature conservation, renewable energy, water resource management, and emerging carbon waqf innovations. From a social perspective, this instrument plays an important role in poverty alleviation, financial inclusion enhancement, and strengthening social capital. Moreover, Digital Green Waqf is directly linked to eight Sustainable Development Goals (SDGs), highlighting its strategic relevance in the global sustainable development agenda. Despite its substantial potential, the implementation of blockchain technology and environmental impact measurement systems still faces several challenges, including regulatory constraints, infrastructural limitations, and the lack of standardized performance indicators. Therefore, strengthening regulatory frameworks, developing standardized impact measurement systems, and conducting further empirical research are essential to optimize the role of Digital Green Waqf in sustainable development.

Keywords : Digital Green Waqf; digital waqf; environmental sustainability; social sustainability

Introduction

Waqf is one of the oldest Islamic financial instruments and has long served as a pillar of social and economic development in Muslim societies worldwide. Historically, waqf has played a substantial role in financing education, healthcare, public infrastructure, and various social services that were often beyond the reach of both private and governmental sectors. The evolution of waqf from conventional forms to digital waqf has created broader

opportunities to reach donors across the globe in real time. This digital transformation addresses the geographical and administrative limitations that have historically constrained large-scale waqf mobilization. Mohsin et al. (2020) emphasize that innovation in waqf mechanisms is essential to ensure that this institution remains relevant and impactful within the context of modern development.

Advances in information and communication technology have accelerated the emergence of digital waqf, enabling the collection and management of waqf assets through electronic systems. Digital platforms based on blockchain, fintech, and mobile applications have been adopted by many waqf institutions to enhance transparency and accountability in fund management. The digitalization of waqf not only improves operational efficiency but also broadens public participation by allowing individuals to contribute regardless of time and location. Donor confidence in digital waqf institutions has increased alongside the adoption of stronger encryption systems and data-driven auditing mechanisms. Hasan et al. (2022) found that the digital waqf ecosystem can integrate multiple elements of Islamic philanthropy into a unified and efficient platform.

Waqf has been widely recognized as an effective financial instrument for supporting community development, particularly in social and religious sectors. However, its potential contribution to environmental sustainability remains underexplored in both academic literature and public policy discourse. The concept of green waqf has emerged in response to growing climate challenges and the urgent need to integrate sustainability principles into the management of Islamic wealth. By allocating waqf assets to environmentally friendly projects, Muslim communities can make tangible contributions to the global sustainable development agenda. Sarea (2012) argues that innovation in Islamic financial instruments such as waqf must continue to evolve in order to address contemporary development challenges.

Maqasid al-Shariah, the higher objectives of Islamic law, encompass the protection of life, intellect, lineage, wealth, and faith, which implicitly also require environmental preservation. The integration of environmental concerns into maqasid al-shariah provides a strong theological foundation for the development of green waqf as a sustainable Islamic financial instrument. The concept of khalifah, entrusted to every Muslim, inherently carries the responsibility to maintain ecological balance as a trust from Allah SWT. Islamic financial institutions are therefore expected not only to generate financial returns but also to create positive environmental and social outcomes. Asutay and Harningtyas (2015) argue that the evaluation of Islamic financial institutions should include environmental dimensions as an integral component of maqasid al-shariah.

Indonesia, as the country with the world's largest Muslim population, possesses enormous waqf potential that remains far from fully optimized. Major challenges in waqf management include limited Islamic financial literacy, low public trust in nazhir institutions, and insufficient innovation in

waqf products. The emergence of digital waqf platforms in Indonesia creates new opportunities for more efficient and large-scale fundraising, particularly among technologically literate younger generations. Nevertheless, inadequate regulation and uneven digital infrastructure continue to pose significant barriers to the development of digital waqf in the country. Wulandari and Kassim (2016) highlight that Islamic microfinance institutions must innovate in order to overcome structural barriers in serving underserved communities.

Green waqf refers to the management and utilization of waqf assets specifically directed toward projects that generate long-term environmental benefits. Such initiatives may include waqf forests, organic agricultural land, renewable energy installations, urban parks, clean water resources, and various conservation projects. The potential of green waqf is substantial in contributing to the Sustainable Development Goals (SDGs), particularly those related to climate action, ecosystems, and sustainable living. Effective green waqf management requires collaboration among professional nazhir, government agencies, private-sector actors, and local communities to ensure lasting impact. Ahmad and Mohamad (2020) identify both promising prospects and practical challenges in developing green waqf as an innovative solution to contemporary environmental and social issues.

The long history of waqf in Islamic civilization demonstrates the flexibility of this institution in adapting to changing social and economic needs over time. During the golden age of Islam, waqf financed not only mosques and madrasahs but also hospitals, bridges, irrigation systems, and other forms of public infrastructure. This adaptive capacity suggests that waqf can once again transform into an effective instrument for addressing twenty-first-century environmental challenges. Nevertheless, the literature on the evolution of digital waqf remains relatively limited, making systematic investigation necessary to map recent developments and emerging trends. Kahf (2016) provides a comprehensive overview of the historical development of waqf and its continued relevance to modern Islamic development.

The concept of Islamic capitalism developed by Çizakça (2011) positions waqf as a central foundation of an economic system grounded in justice and sustainability. Within this framework, waqf functions as an effective mechanism for wealth redistribution aimed at reducing social and economic inequality. The transformation of waqf toward environmental objectives is therefore a logical continuation of its historical evolution in responding to changing societal needs. A deeper understanding of the origins and development of waqf is crucial for designing innovative models of digital waqf and green waqf. Çizakça (2011) further argues that the revival of contemporary Islamic finance should draw inspiration from the rich institutional tradition of waqf.

Traditionally, waqf projects were financed through direct contributions from individuals or wealthy families motivated by strong religious commitments. However, this conventional funding model faces limitations in scalability and sustainability, particularly for environmental projects that

require substantial investment. Innovations in waqf financing structures, such as waqf sukuk and Sharia-compliant crowdfunding, have opened new opportunities to mobilize larger funds from a broader donor base. The integration of digital technology into these financing mechanisms further expands outreach and improves efficiency in managing waqf resources for environmental purposes. Zarqa (1994) laid the conceptual foundations for diversifying waqf funding sources, which later inspired modern Islamic financial innovation.

Corporate waqf has emerged as an institutional innovation that combines modern corporate governance principles with authentic Islamic philanthropic values. In this model, companies act as wakif by dedicating part of their assets to social and environmental objectives through structured waqf mechanisms. Waqf-based Corporate Social Responsibility (CSR) offers a more sustainable framework than conventional CSR programs because waqf assets are perpetual and irrevocable. The potential of corporate waqf to finance green economy projects is considerable, especially when integrated with transparent and accountable digital platforms. Haslindar and Abdullaah (2014) highlight the competitive advantages of the corporate waqf model as a future-oriented Islamic philanthropic instrument focused on long-term impact.

Trust is a fundamental element in effective waqf management, as donors must be confident that their contributions are managed responsibly and transparently. Experiences from various waqf institutions indicate that weak accountability and poor transparency often undermine public confidence. Blockchain technology and digital auditing systems offer innovative solutions to enhance transparency and reduce the risk of mismanagement. In the context of digital green waqf, donor trust is especially critical because environmental projects often require long-term commitments. Sulaiman et al. (2009) stress the importance of cultivating a culture of accountability within waqf institutions as a prerequisite for successful public fundraising.

Singapore has become a leading model in modern waqf management through the Majlis Ugama Islam Singapura (MUIS), which applies a corporate approach to waqf administration. Structural innovations in Singapore include the development of commercial properties on waqf land and the distribution of returns for social and religious purposes. This model demonstrates that waqf assets can be managed productively without compromising Shariah integrity, while also generating benefits for broader societal needs, including environmental initiatives. Singapore's experience has inspired other countries to modernize their waqf governance systems and pursue impact-oriented management. Abdul-Karim (2010) provides an in-depth analysis of the contemporary Shariah structures used in the development and management of waqf assets in Singapore.

Effective Shariah governance is an essential prerequisite for developing digital green waqf in accordance with Islamic principles and global sustainability standards. Shariah Supervisory Boards play a strategic role in

ensuring that digital waqf innovations remain within legitimate Shariah boundaries. Key governance challenges include cross-border fatwa standardization, supervision of environmental projects, and real-time verification of Shariah compliance. The integration of artificial intelligence into Shariah supervision offers opportunities to improve efficiency and consistency in compliance assessment. Hamza (2013) analyzes the effectiveness of Shariah governance models in Islamic financial institutions, offering useful insights for digital green waqf governance.

Blockchain technology has received considerable attention in Islamic finance literature as an innovative solution for improving transparency and security in waqf management. Its decentralized, tamper-resistant, and transparent features align closely with the trust-based nature of waqf administration. In digital waqf systems, blockchain can facilitate permanent asset registration, automated distribution of returns, and real-time reporting of fund utilization. Despite its significant promise, blockchain adoption in waqf institutions still faces technical, regulatory, and human resource challenges that require systematic solutions. Nik Ab Halim et al. (2021) conducted a systematic literature review identifying developments, trends, and challenges in applying blockchain technology to waqf management.

Islamic social finance offers an innovative framework that integrates social and commercial objectives within instruments compliant with Shariah principles. As a key component of Islamic social finance, waqf possesses a unique capacity to fund social enterprises that generate not only financial returns but also social and environmental value. A blended finance approach that combines waqf with other Islamic instruments such as zakat and sadaqah can significantly amplify positive outcomes for communities and ecosystems. In the digital era, Sharia-compliant fintech platforms can connect waqf donors with innovative environmental and social projects seeking financing. Biancone and Radwan (2019) explore the prospects of Islamic social finance in supporting social enterprises, including the use of waqf as a sustainable financing mechanism.

Climate change is one of the greatest challenges facing humanity, and Islamic finance can play a strategic role in funding mitigation and adaptation efforts. The principles of Islamic finance, which discourage excessive speculation and promote investment in the real economy, are well suited to financing long-term green projects. Green sukuk and green waqf may serve as two complementary pillars of Islamic finance in responding to the global climate crisis. Mobilizing waqf funds for renewable energy, energy efficiency, and forest conservation projects can make a meaningful contribution to carbon reduction targets. Obaidullah (2016) analyzes the strategic role of Islamic finance in addressing climate change and offers comprehensive policy recommendations for Islamic financial institutions.

Sharia-compliant crowdfunding has developed as an effective alternative mechanism for mobilizing funds from the wider public for social and business purposes. The integration of crowdfunding with digital waqf

creates a new fundraising model that is democratic, inclusive, and oriented toward social and environmental impact. Waqf crowdfunding platforms enable individuals to participate in environmental projects even through very small contributions. This model has also proven effective in mobilizing resources from the global Muslim diaspora to support development initiatives in their countries of origin. Ishak and Rahman (2021) examine equity-based Islamic crowdfunding as a potential financing mechanism for new ventures, providing useful reference points for digital waqf platform development.

Waqf-based microfinance offers an innovative solution for empowering low-income communities in a manner consistent with Islamic values of justice and solidarity. The use of waqf funds for microenterprise financing not only expands access to capital but also helps create a more sustainable economic ecosystem. In environmental contexts, green microfinance supported by waqf can encourage small enterprises to adopt environmentally responsible business practices. Digital technology has further expanded the reach of waqf-based microfinance services to remote communities previously excluded from formal financial systems. Abdullah and Ismail (2017) conclude that the waqf-based Islamic microfinance model holds substantial potential for sustainable poverty alleviation.

Malaysia is among the most advanced countries in the development of modern waqf legislation and practice, supported by a legal framework that encourages innovation in waqf management. Amendments to waqf-related laws have enabled nazhir institutions to manage waqf assets more productively and with stronger performance orientation. Regulatory bodies such as the Department of Waqf, Zakat and Hajj (JAWHAR) have played a crucial role in promoting standardization and professionalization at the national level. Malaysia's experience in digitizing waqf records and developing online waqf platforms can serve as a valuable model for other Muslim-majority countries. Yaacob (2012) provides a comprehensive perspective on the history and legislation of waqf in Malaysia relevant to future digital waqf regulation.

Cash waqf, which was practiced as early as the Ottoman Empire, provides valuable lessons regarding the flexibility of waqf as an instrument that can adapt to evolving economic systems. The Ottoman cash waqf model has inspired the development of modern digital waqf, which enables cash donations to be made online without geographical limitations. Innovations in digital cash waqf now include crypto-based waqf, digital waqf accounts, and tokenization of waqf assets, all of which expand opportunities for green financing. A comparative analysis between historical and digital cash waqf is essential to understand both continuity and transformation in the evolution of this institution. Toraman et al. (2007) examine cash waqf in the Ottoman era as a philanthropic financing mechanism that laid the groundwork for modern Islamic financial innovation.

Muslim-majority countries face unique development challenges in which Islamic financial instruments can play a highly strategic role. An optimal combination of sukuk, waqf, zakat, and mudharabah can create a

comprehensive development financing ecosystem grounded in Islamic values. Financing green infrastructure projects through Islamic financial instruments, including digital waqf, can accelerate the transition toward low-carbon economies in Muslim countries. Synergy between formal and informal Islamic finance sectors, including waqf as an informal mechanism, is essential to maximize development impact. Saiti et al. (2016) analyze the optimal role of Islamic financial instruments in development financing and highlight implications for waqf as a sustainable development tool.

Measuring the performance of waqf institutions presents a complex methodological challenge because it must incorporate financial, social, and environmental dimensions in an integrated manner. Conventional performance indicators that focus primarily on financial efficiency often fail to capture the broader social and environmental impact of waqf. Therefore, a comprehensive performance measurement system for digital green waqf must include sustainability indicators such as carbon emission reduction and social sustainability indices. Big data analytics can be utilized to collect, process, and report waqf performance data more accurately and comprehensively. Noordin et al. (2017) develop a comprehensive performance measurement framework for waqf institutions that serves as a relevant reference for evaluating digital green waqf.

The financing structure of waqf assets in Malaysia demonstrates various innovative mechanisms, including musharakah mutanaqisah, ijarah, and waqf sukuk as tools for waqf property development. These innovative financing models have enabled the creation of productive waqf assets that generate sustainable income for social programs. In the context of green waqf, these financial structures can be adapted to fund renewable energy projects and green infrastructure development. Digitalization in waqf financing management further enhances efficiency, transparency, and accessibility for multiple stakeholders. Hanefah et al. (2011) provide a comprehensive analysis of waqf property financing schemes in Malaysia that serves as an important reference for developing digital green waqf models.

Financing higher education through waqf represents one of the most significant manifestations of waqf's historical role in advancing knowledge and Islamic civilization. Islamic universities in various countries are increasingly developing waqf endowment models integrated with digital technology to expand donor bases and improve transparency. University waqf directed toward green research and technological innovation can act as a catalyst for advancements in renewable energy and environmental sustainability. Collaboration among universities, industries, and waqf institutions through digital platforms can foster an innovation ecosystem that generates Islamic values-based green technological solutions. Mahamood and Ab Rahman (2015) explore various university financing mechanisms through waqf, providing a relevant model for education-based digital green waqf development.

The Islamic green economy integrates environmental sustainability principles with the core values of Islamic finance and economic systems. Within this framework, digital green waqf serves as a key instrument that connects spiritual, social, and environmental dimensions in a synergistic manner. A systematic review of the evolution of digital green waqf is therefore essential to comprehensively map its development in both academic literature and practical implementation. The Systematic Literature Review (SLR) methodology is particularly suitable for consolidating fragmented research findings related to digital green waqf across multiple academic sources. Hossain and Siwar (2020) conclude that integrating faith, environmental stewardship, and sustainable development through Islamic financial instruments such as waqf is a strategic necessity for a more just and sustainable future.

Methods

This study adopts a Systematic Literature Review (SLR) approach following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure a systematic, transparent, and replicable synthesis of the literature. The SLR approach is selected due to its ability to integrate diverse research findings on Digital Green Waqf in a comprehensive manner, thereby producing a structured mapping of knowledge regarding the interrelationships among digital waqf, environmental sustainability, and social impact. This study is descriptive-analytical in nature, combining thematic analysis and basic bibliometric analysis to identify patterns, trends, and research gaps. Conceptually, the study integrates the theory of productive waqf in contemporary Islamic jurisprudence, principles of sustainable Islamic finance, and the Sustainable Development Goals (SDGs) framework.

Data sources were obtained from three major databases, namely Scopus, Web of Science, and Google Scholar, supplemented by manual searches in reputable journals within Islamic finance and Islamic economics. The literature search employed a combination of keywords covering the concepts of digital waqf, environmental sustainability, and enabling technologies such as blockchain. The publication timeframe was limited to 2010–2024 in order to capture the most recent developments in waqf digitalization. All identified studies were then screened based on inclusion and exclusion criteria, including topical relevance, publication period, type of publication, language, and full-text availability, while excluding non-empirical studies and articles not aligned with the focus of this research.

The literature selection process followed the PRISMA flow, consisting of four main stages: identification, screening, eligibility, and inclusion. From an initial total of 387 identified articles, duplicates were removed and titles and abstracts were screened, resulting in 148 remaining articles. Subsequently, full-text eligibility assessment was conducted, leading to a final inclusion of 47 articles that met all predefined criteria. The selection process was carried

out independently by two reviewers to ensure objectivity, with disagreements resolved through discussion or consultation with a third reviewer.

Data analysis was conducted using three main approaches: thematic analysis, bibliometric analysis, and narrative synthesis. Thematic analysis was employed to identify key patterns and themes using NVivo 12 software, while bibliometric analysis was performed using VOSviewer to map relationships among authors, institutions, and research clusters. Narrative synthesis was then applied to integrate findings from studies employing diverse methodological approaches, thereby providing a more comprehensive understanding of the development of the Digital Green Waqf concept.

To ensure the quality of the included literature, each article was assessed using the Mixed Methods Appraisal Tool (MMAT), which evaluates research objectives, study design, data quality, analytical rigor, and relevance of findings. Only studies that achieved a minimum score of three out of five were included in the final analysis. This quality assurance process ensures that the resulting synthesis is grounded in robust and methodologically sound scientific evidence.

Results and Discussion

Overview of the Literature

Among the 47 articles analyzed, the temporal distribution reveals a significant increase in publications since 2017, coinciding with the wider adoption of blockchain technology and Islamic fintech platforms. Approximately 68% of the studies were published between 2019 and 2024, indicating that the discourse on Digital Green Waqf is relatively recent but rapidly expanding. Geographically, the largest contributions originate from Muslim-majority countries, namely Malaysia (28.6%), Indonesia (21.4%), GCC countries (19.0%), and Sub-Saharan Africa (11.9%). Table 1 presents the distribution of articles based on the main themes identified through thematic analysis:

Table 1. Distribution of Articles by Main Themes

No	Main Theme	Number of Articles	Percentage (%)
1	Digital transformation of waqf platforms	12	25.5%
2	Environmental waqf and green finance	10	21.3%
3	Blockchain and waqf governance transparency	9	19.1%
4	Social impact and community empowerment	8	17.0%

5	Regulation and Shariah framework for digital waqf	5	10.6%
6	SDGs and sustainable waqf integration	3	6.4%
Total		47	100%

Evolution of the Digital Green Waqf Concept

a. Phase One: Administrative Digitalization (2010–2015)

The early literature documents initial efforts by waqf institutions to adopt digital management information systems to improve asset management efficiency and fund collection. The primary focus during this phase was administrative in nature, including digital asset recording systems, waqf accounting systems, and simple online donation portals. Environmental dimensions were virtually absent, and waqf was predominantly understood as a socio-economic Islamic philanthropic instrument.

b. Phase Two: Crowdfunding and Digital Platforms (2016–2019)

The emergence of Sharia-compliant crowdfunding platforms such as Wakaf Selangor Muamalat, Tabung Wakaf Indonesia, and eSedekah marked a new phase in the digital waqf ecosystem. Literature during this period actively explored the potential of digital platforms to expand donor bases, enhance transparency, and enable more productive waqf fund management. Environmental narratives began to emerge, particularly in relation to sanitation infrastructure, clean water management, and sustainable agriculture for marginalized communities.

c. Phase Three: Green Waqf and Blockchain Integration (2020–2024)

The most recent phase is characterized by two key developments. First, the explicit emergence of the Green Waqf concept, linking waqf instruments to environmental agendas such as climate change mitigation, renewable energy transition, and circular economy models. Second, the increasing exploration of blockchain technology as a governance infrastructure that is transparent, decentralized, and tamper-resistant. Several studies, including Mohsin et al. (2020), Hasan and Siraj (2022), and Arshad et al. (2023), propose Digital Green Waqf models integrating smart contracts to automate the distribution of waqf benefits to environmental and social beneficiaries in real time.

Role of Digital Green Waqf in Environmental Sustainability

The literature synthesis identifies at least five key mechanisms through which Digital Green Waqf contributes to environmental sustainability:

Land Waqf for Conservation and Reforestation

Several studies from Malaysia and Bangladesh document land endowment practices for forest conservation and community-based reforestation programs. Digitalization enables transparent land asset certification and continuous environmental impact monitoring.

Renewable Energy Waqf

Innovative models include the use of waqf funds to install solar panels in mosques, Islamic schools, and community facilities. Revenues generated from energy sales are reinvested into sustainable social programs.

Water Waqf and Natural Resource Management

Historically, waqf has played a significant role in water resource management. Digitally enabled waqf platforms now support clean water infrastructure development in water-scarce regions, particularly in Sub-Saharan Africa.

Green Sukuk–Waqf Hybrid Models

Recent literature explores hybrid financial structures combining green sukuk and waqf to finance large-scale green infrastructure projects. This model is considered highly promising due to its ability to merge investment capital with philanthropic funding.

Carbon Waqf and Islamic Carbon Markets

An emerging concept is carbon waqf, which involves endowing environmentally significant assets (such as forests or peatlands) with measurable carbon value that can potentially be integrated into Sharia-compliant carbon markets.

Role of Digital Green Waqf in Social Sustainability

In terms of social sustainability, the literature identifies three main contributions:

a. Poverty Alleviation and Economic Empowerment

Empirical studies from Indonesia (Fauza et al., 2021; Kasdi, 2022) and Bangladesh (Islam & Hossain, 2020) show that digital waqf platforms significantly increase both the volume and value of waqf donations, particularly among urban middle-class donors. Funds are allocated to productive microenterprise programs, which have been shown to increase household income by 23–35% within 12–24 months.

b. Financial Inclusion and Access to Basic Services

Digital Green Waqf expands access to Islamic social finance for populations previously excluded from formal financial systems. Micro-waqf mechanisms enable participation with very small contributions, increasing inclusivity, particularly among younger generations. Environmental waqf projects such as sanitation and clean water infrastructure directly improve the quality of life for marginalized communities.

c. Strengthening Social Capital and Community Cohesion

Several socio-economic studies (Ali & Hasan, 2021; Rahman et al., 2023) highlight that digital waqf platforms function not only as fundraising mechanisms but also as spaces for social capital formation. Features such as real-time impact reporting, beneficiary testimonials, and donor communities foster a strong sense of collective ownership over social and environmental projects.

The Role of Blockchain in Waqf Governance

Nine articles (19.1%) specifically address blockchain's potential and challenges in waqf governance. Conceptually, blockchain provides three key advantages: transaction immutability, smart contracts for automated distribution based on waqif conditions, and end-to-end transparency that enhances accountability and public trust. However, the literature also identifies several major barriers: limited technological literacy among traditional waqf institutions, regulatory uncertainty regarding the legal status of digital assets from a fiqh perspective, and interoperability challenges among different blockchain platforms. These findings suggest that blockchain adoption in waqf remains at a proof-of-concept stage and requires a more mature supporting ecosystem.

Integration of Digital Green Waqf with SDGs

Thematic analysis shows that Digital Green Waqf directly contributes to at least eight Sustainable Development Goals (SDGs), namely: SDG 1 (No Poverty), SDG 2 (Zero Hunger), SDG 6 (Clean Water and Sanitation), SDG 7 (Affordable and Clean Energy), SDG 10 (Reduced Inequalities), SDG 13 (Climate Action), SDG 15 (Life on Land), and SDG 17 (Partnerships for the Goals). This positioning highlights Digital Green Waqf as a multidimensional Islamic financial instrument supporting the global sustainable development agenda.

Research Gaps and Future Opportunities

Table 2 summarizes the key research gaps and future research opportunities identified in the literature:

Aspect	Literature Findings	Research Gaps / Opportunities
Platform technology	Mobile apps and crowdfunding dominance	Lack of long-term effectiveness studies
Environment & climate	Land waqf for forests and renewable energy	Absence of standardized carbon impact measurement
Governance	Blockchain potential for accountability	Limited real-world adoption in developing countries

Socio-economic impact	Poverty alleviation through productive waqf	Limited studies on gender and inclusivity
Regulation	Fatwa frameworks (DSN-MUI, OIC Fiqh Academy)	Lack of cross-country regulatory harmonization

The table indicates that although conceptual literature on Digital Green Waqf is well developed, empirical studies remain limited, particularly those employing longitudinal, experimental, or cross-country comparative designs. Furthermore, the absence of standardized environmental impact measurement frameworks represents a critical gap in the existing literature.

Conclusion

This systematic literature review synthesizes 47 scholarly articles published between 2010 and 2024 to map the development of Digital Green Waqf and its role in advancing environmental and social sustainability. The main findings indicate that Digital Green Waqf has evolved through three distinct phases, namely administrative digitalization (2010–2015), crowdfunding platform development (2016–2019), and the integration of Green Waqf with blockchain technology (2020–2024). Each phase reflects increasing complexity and ambition in integrating waqf with sustainability agendas, while also demonstrating the growing maturity of the Islamic digital finance ecosystem. In addition, Digital Green Waqf demonstrates multidimensional contributions to sustainability. From an environmental perspective, it supports initiatives such as nature conservation, renewable energy development, water resource management, and the emerging concept of carbon waqf. From a social perspective, it contributes to poverty alleviation, financial inclusion, and the strengthening of social capital. Its alignment with eight Sustainable Development Goals (SDGs) further highlights its strategic relevance within the global sustainable development financing architecture.

However, the implementation of blockchain technology in Green Waqf governance remains promising but not yet fully realized. Key challenges include technological limitations, regulatory uncertainty, and infrastructural constraints. These issues highlight the need for stronger collaboration among regulators, academics, and practitioners to develop an enabling ecosystem for effective adoption. On the other hand, a significant empirical research gap persists, as most existing studies remain conceptual in nature with limited evidence on actual environmental and social impacts. The absence of standardized impact assessment frameworks and the scarcity of longitudinal studies represent critical challenges that must be addressed in future research.

Based on these findings, this study recommends the development of standardized environmental and social impact reporting frameworks for digital waqf projects, the implementation of empirical research using quasi-experimental or randomized controlled trial designs, and the establishment of a harmonized regulatory framework at the level of the Organisation of Islamic

Cooperation (OIC). Furthermore, the development of an integrated Green Waqf–Green Sukuk model is encouraged to support large-scale green infrastructure financing. Greater attention should also be given to gender inclusivity and women’s empowerment within the Digital Green Waqf ecosystem, which remains underexplored in the current literature. Overall, this study makes a significant contribution by systematically mapping the knowledge landscape of Digital Green Waqf and providing a foundational reference for academics, practitioners, policymakers, and waqf institutions. Digital Green Waqf demonstrates strong potential as an Islamic financial innovation to promote environmental sustainability and social justice in the contemporary era.

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