

Development of Digital Green Waqf for Social Sustainability in Riau, Indonesia

Wali Saputra

State Islamic University of Sultan Syarif Kasim Riau

Corresponding Author's Email: saputrawali@gmail.com

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ABSTRACT

This scholarly investigation endeavors to formulate a digital green waqf model that underpins social sustainability within the Riau Province, employing a qualitative methodology. Through comprehensive interviews conducted with ten informants, which include nadzir waqf, scholars, government officials, notable public figures, and practitioners in sharia fintech, the research scrutinized the comprehension, obstacles, advantages, developmental strategies, and anticipations and recommendations pertaining to digital green waqf. The findings indicate that digital green waqf possesses significant potential to enhance community engagement, particularly among the youth demographic, as well as to foster transparency and efficacy in waqf administration. Nevertheless, considerable impediments exist in the form of inadequate digital literacy, infrastructural deficiencies, and regulatory frameworks that remain non-adaptive. The proposed developmental strategies encompass the enhancement of educational and training programs, fortification of infrastructure, fostering synergies among multiple stakeholders, and the adoption of transparent technologies grounded in sharia principles. The study concludes that digital green waqf may serve as an innovative remedy for the socially and environmentally sustainable management of waqf in Riau, contingent upon comprehensive backing from diverse stakeholders.

Keywords: digital green waqf, digital waqf, social sustainability, Riau, digital literacy, fintech sharia

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INTRODUCTION

The introduction section contains: background, a brief literature review of previous research on the topic (there must be a reference to a journal published within the last 10 years), differences from The waqf, functioning as a mechanism of Islamic charitable giving, has experienced a profound metamorphosis in the context of the digital era, facilitating enhanced transparency and efficacy in management practices (Alfarisi & Huda,2023). The assimilation of digital technologies within the realm of waqf management presents novel avenues to enhance sustainable development and promote social welfare in Indonesia. The research conducted by Takwin (2024) underscores the potential of digital crowdfunding platforms to maximize the mobilization of waqf resources for environmental initiatives, including the reforestation of ecologically significant areas.

The notion of green waqf emerged as a reaction to ecological challenges and the imperative for sustainable development (Takwin,2024). Through this methodology, the waqf functions not solely as a philanthropic endeavor, but also as an instrument for ecological preservation and enhancement of individuals' living standards. Takwin (2024) underscores that the amalgamation of green waqf with digital platforms has the potential to significantly augment its societal and environmental influence. The application of digital technologies in the administration of waqf facilitates enhanced transparency and accountability, in addition to expanding the scope of community engagement. Hatimah et al. (2023) discerned potential avenues in the deployment of digital assets to bolster the green economy via digital waqf, notwithstanding the persistent challenges pertaining to governance and regulation.

The execution of green waqf initiatives in Indonesia has demonstrated significant promise in facilitating environmental conservation and enhancing community empowerment. Irfany et al. (2023) advocate for a developmental strategy of green waqf aimed at safeguarding terrestrial ecosystems through the application of an Interpretive Structural Modeling methodology, which can serve as a framework for the planning and execution of green waqf programs. The amalgamation of green waqf with carbonization technology presents novel strategies for the management of waste and the generation of renewable energy (Takwin,2024). Hasan and Syahrudin (2023) assert that this methodology aligns with the Sustainable Development Goals (SDGs), especially concerning the domains of clean energy and climate change mitigation efforts.

The advancement of waqf-oriented sustainable industries, exemplified by the tamanu sector, illustrates the capacity of waqf to concurrently bolster both the local economy and efforts in environmental preservation. The research conducted by Abdullah and Susanto (2019) elucidates the significance of sharia-compliant crowdfunding in facilitating the growth of halal micro, small, and medium enterprises (MSMEs) via waqf-driven investments. The execution of digital waqf in Indonesia continues to encounter a myriad of obstacles, particularly in relation to regulatory frameworks, digital literacy levels, and the trust of the community. Nevertheless, through the implementation of appropriate strategies, digital waqf has the potential to serve as a potent mechanism for fostering social and environmental advancement (Takwin,2024). Hatimah et al. (2023) underscore the critical necessity of cultivating targeted literature and regulatory frameworks in the administration of digital waqf assets.

The collaboration among waqf institutions, governmental bodies, and the private sector is imperative for the establishment of a sustainable digital waqf ecosystem. Initiatives such as the creation of sharia-compliant crowdfunding platforms can enhance communal engagement and ensure the long-term viability of environmentally sustainable waqf initiatives. Abdullah and Susanto (2019) demonstrated that

investments sourced through sharia crowdfunding can facilitate the advancement of halal micro, small, and medium enterprises (MSMEs) in Indonesia. The dissemination of knowledge and the cultivation of public awareness regarding digital waqf and green waqf are imperative to promote active involvement in these initiatives. Takwin (2024) underscores that a comprehensive grasp of the principles and advantages associated with green waqf has the potential to enhance individuals' trust and engagement in digital waqf initiatives. By utilizing digital technologies and pioneering methodologies, waqf can assume a pivotal role in fostering sustainable socio-environmental advancement in Indonesia. The emergence of green digital waqs presents substantial prospects for the concurrent enhancement of public welfare and ecological preservation. Alfarisi and Huda (2023) assert that the amalgamation of green waqs via crowdfunding digital platforms can yield a considerable social impact for the community.

LITERATURE REVIEW

Grand Theories

The Theory of Maqāṣid al-Sharī'ah

The theory of Maqāṣid al-Sharī'ah elucidates the fundamental objectives of Islamic law, which include the safeguarding of religion, life, intellect, lineage, and property. Within the framework of digital green waqf, this theory holds significant relevance as waqf is employed as a mechanism to attain social welfare and environmental sustainability, aligning with the overarching aims of sharia (Maisyarah & Hadi, 2024). Research conducted by Abdullah (2018) indicates that waqs can play a pivotal role in the realization of the Sustainable Development Goals (SDGs) by employing the Maqāṣid al-Sharī'ah framework.

Sustainable Development Theory

This theoretical framework underscores the critical significance of fulfilling present requirements while ensuring that future generations retain the capacity to satisfy their own needs. The concept of digital green waqf aligns with this tenet, as it seeks to facilitate the sustainable conservation of both the environment and societal welfare. Research conducted by Auna Nida Ulhusna et al. (2024) elucidates the function of digital waqf in the attainment of sustainable development objectives within the context of Indonesia.

Theory of Technological Advancement and Innovation

This theoretical framework elucidates the mechanisms through which the assimilation of novel technologies can catalyze innovation across various domains. In relation to the digital green waqf, the implementation of technologies like blockchain has the potential to enhance both transparency and operational efficiency in the administration of the waqf (Maisyarah & Hadi, 2024). The investigation conducted by Sukaina et al. (2022) pioneered the creation of an online application utilizing blockchain technology for the purpose of funding tamanu productivity, thereby contributing to initiatives aimed at environmental conservation.

Social Innovation Theory

The theory of social innovation elucidates the mechanisms through which novel solutions may be formulated to address unfulfilled societal requirements. The digital green waqf represents a significant advancement in Islamic philanthropic practices, utilizing digital technology as a means to tackle both environmental and social challenges (Maisyarah & Hadi, 2024). The scholarly investigation conducted by

Alfarisi and Huda (2023) elucidates that the incorporation of green waqf via digital crowdfunding platforms possesses the potential to engender a considerable social impact within the community.

Digital Green Waqf

Concept of Digital Green Waqf

The digital green waqf represents a novel approach in the administration of waqf, integrating digital technology with the foundational principles of environmental sustainability. This concept aspires to harness advanced technologies, including blockchain, to bolster waqf initiatives aimed at fostering environmental conservation. Consequently, the waqf functions not merely as a religious instrument, but also as a mechanism for advancing the objectives of sustainable development (Sukaina et.al,2022).

The Significance of Blockchain Technology in Waqf

The integration of blockchain technology provides enhanced transparency and security within waqf transactions. Utilizing this innovative system, each waqf transaction can be documented permanently and irreversibly, thereby augmenting the public's trust in the administration of waqf. Furthermore, the blockchain technology allows for the real-time monitoring of waqf funds, thereby promoting effective oversight and accountability(Sukaina et.al,2022).

Implementation of Green Waqf in Environmental Projects

The concept of Green Waqf is primarily centered on the allocation of financial resources towards initiatives that foster the conservation of the environment, encompassing activities such as afforestation, waste management strategies, and the promotion of renewable energy sources. By utilizing waqf financial assets for these endeavors, it is anticipated that sustainable advantages will be conferred upon both the ecological system and the broader community (Sukaina et.al,2022).

Tamanoo Application as a Sustainable Waqf Digital Innovation

Tamanoo represents a blockchain-enabled platform designed to enhance the efficacy of green waqf initiatives. The application streamlines waqf financial transactions aimed at supporting projects dedicated to environmental conservation, including the cultivation of Tamanu crops. Utilizing blockchain technology, Tamanoo guarantees a high level of transparency and accountability in the administration of waqf resources(Sukaina et.al,2022).

The Interconnection between Green Economy and Islamic Finance

The notion of green economy underscores the importance of sustainable and ecologically conscious economic development. Islamic finance, characterized by its foundational tenets that advocate for social equity and ecological stewardship, possesses significant capacity to bolster the green economy via mechanisms such as the green waqf (Rusydiana & Bahri,2021).

Challenges in Digital Green Waqf Implementation

Notwithstanding its substantial potential, the execution of digital green waqf encounters a multitude of challenges, including insufficient public comprehension of blockchain technology, regulatory frameworks that have yet to provide adequate support, and deficiencies in digital infrastructure in certain regions. Consequently, there is a pressing need for educational initiatives and policy support to facilitate the integration of digital green waqf (Vidiati et.al,2021).

Social Sustainability

Definition of Social Sustainability

Social sustainability denotes the capacity of a societal framework to evolve and operate in a manner that is sustainable, thereby safeguarding public welfare, promoting social equity, and fostering the active involvement of its constituents. The notion encompasses dimensions such as equity, health, education, and civic participation. As articulated by Ajmal et al. (2018), the amalgamation of social indicators such as equity, deprivation, and workforce engagement is paramount in the formulation of sustainable business paradigms.

Indicators of Social Sustainability in Indonesia

In the context of Indonesia, the assessment of social sustainability is conducted through the Social Sustainability Index (IKS), which facilitates a comparative analysis of social advancement across various provinces. Faruk (2020) demonstrated a positive correlation between the IKS and the Human Development Index (IPM) as well as the Gross Regional Domestic Product (PDRB) per capita, indicating that both human and economic development significantly influence social sustainability.

Socially Responsible Business Strategies

Business strategies that prioritize social dimensions can enhance the social sustainability outcomes of organizations. Tjahjadi et al. (2024) concluded that socially responsible business strategies, underpinned by social management frameworks and spiritual capital, yield favorable effects on social sustainability performance in micro, small, and medium enterprises (MSMEs) within East Java.

Community Involvement in Environmental Initiatives

Engaged community involvement is critical to the efficacy of environmental initiatives. Firmansyah et al. (2024) demonstrated that the degree of community involvement in Sindangsari Village, Tangerang Regency, significantly influences the effectiveness of the Tampang Bank initiative, thereby contributing to both social and environmental sustainability.

Prior Researches

The following enumerates several antecedent investigations that have examined the prevalent occurrence of Green Waqf within the Indonesian context, comprising: The research conducted by Ningsih (2022) elucidates that there exists a need for 14 million hectares of critical land to facilitate the establishment of Green Waqf in Indonesia by the year 2021. By employing Interpretive Structural Modeling, this investigation aims to delineate the Green Waqf initiative in Indonesia, while also identifying and scrutinizing the fundamental sub-components of the Green Waqf development strategy pertinent to the management of terrestrial ecosystems within the Indonesian context. The findings indicate that Green Waqf represents a novel framework in Indonesia, wherein the application of waqf aligns with the objectives of Sustainable Development Goals 13 and 15, and has the potential to ultimately fulfill the aims of Sustainable Development Goal 7 in the long run. Furthermore, Green Waqf constitutes one of the initiatives that bolster Green Finance and the Green Economy; thus, a comprehensive strategy is imperative for its advancement in Indonesia. As a robust foundation for the progression of Green Waqf in Indonesia, the strategy proposed in this study encompasses the establishment of a legislative framework for Green Waqf, in conjunction with the proactive engagement and collaboration of regulators, practitioners, and scholars within the Green Waqf Framework in Indonesia.

Ningsih et al. (2022) conducted a study that delineates five core elements essential to the advancement of Green Waqf in Indonesia: the requirements, limitations, objectives, initiatives, and the relevant stakeholders engaged. The primary suggestion is the establishment of a legal framework for Green Waqf to ensure the legitimacy of its development within the Indonesian context.

Eugenia's research (2023) elucidates that the Tamanu planting initiative undertaken by WACiDs in 2021 was instigated as a proactive measure to address the challenges of energy autonomy and the ecological crisis prevalent in Indonesia. The objective of this inquiry is to delineate the strengths, weaknesses, opportunities, and threats while devising a strategic framework for the advancement of green waqf in Indonesia. The methodological approach employed in this research is the Analytical Network Process — Strengths, Weaknesses, Opportunities, and Threats (ANP — SWOT). The findings indicate that strength is prioritized above all other factors. The most significant variables concerning strengths, weaknesses, opportunities, and threats encompass the notion of segments whereby the Tamanu planting initiative can serve as a viable solution to enhance the environment and foster energy independence; conversely, WACiDs currently lacks the necessary financial resources to support the project and its development; moreover, Indonesia is recognized as possessing the most dynamic Islamic social finance sector globally, juxtaposed with a deficient level of public literacy regarding waqf and its critical importance in addressing global concerns associated with environmental sustainability and renewable energy. The proposed strategy advocates for WACiDs to establish synergies with waqf advocates, environmental proponents, and New and Renewable Energy activists.

The research conducted by Hasan & Syahrudin (2022) elucidates that waste continues to represent a significant challenge impeding the sustainable advancement of both the economy and society. Effective waste management is imperative to mitigate environmental degradation and to yield advantages for the collective populace. This study adopted a qualitative methodology through the examination of pertinent literature. The findings underscore that green waqf is highly advocated to bolster the green economy. Waqf, as a philanthropic entity within Islamic tradition, is anticipated to fulfill its vital function in promoting environmental stewardship. The attainment of environmental protection can be facilitated through adept waste management practices. Specifically, the application of Carbonization Technology in waste management has the potential to generate renewable energy, thereby playing an essential role in safeguarding the environment, enhancing living standards, and accelerating economic growth. The promotion of green waqf in conjunction with Carbonization Technology ought to be prioritized as a strategic initiative to reinforce the green economy. It is hoped that this approach aligns with Sustainable Development Goals 7 (sustainable energy), 11 (sustainable cities and communities), and 13 (climate action).

Alfarisi & Huda (2023). This scholarly investigation seeks to elucidate the integration of green waqf via the digital crowdfunding platform and the resultant social ramifications for the community. This research employs a library research methodology in conjunction with a qualitative analytical framework. The integration of green waqf through the digital crowdfunding platform is examined in relation to its potential to actualize sustainable development across generations. Green waqf constitutes one of the instruments within Islamic jurisprudence aimed at addressing the challenges faced by the ummah, particularly those pertaining to environmental concerns linked to sustainable development and intergenerational equity. This inquiry was executed qualitatively utilizing an analytical descriptive design. The findings indicate that green waqf possesses the capacity to reconcile developmental aspirations with

environmental sustainability, thereby fostering enduring ecological preservation and parity among generations, wherein future generations retain comparable levels of resource utilization and access to natural assets as the current demographic. Green waqf represents an innovative movement for environmental conservation, initiated through the mobilization of funds via a crowdfunding mechanism, culminating in the acquisition of critical land designated for reforestation efforts. As the previously degraded land becomes revitalized and assumes ecological significance, it will be allocated to the local village community under the stipulation that the forest is preserved and safeguarded from harm. Green waqf not only addresses the issue of ecological degradation but also yields advantages across various dimensions, including ecology, energy sustainability, social equity, economic development, and community welfare.

Jannah et al. (2021). This research investigated the sustainability of the Waqf forest via agroforestry practices, focusing on a case study of the Waqf Forest located in Bogor. The findings indicate that this methodology has the potential to enhance both forest sustainability and the welfare of adjacent communities.

Ascarya et al. (2022) elucidate that productive waqf constitutes a category of ethical business or investment that necessitates adherence to Islamic law, offering a multitude of models from which to select. The objective of this investigation is to identify the determinants of simple productive waqf, to propose various models of simple productive waqf, and to ascertain the most suitable simple productive waqf models for implementation by waqf institutions in Indonesia. This research employs the analytic network process, which encompasses field surveys, focused group discussions, and comprehensive interviews, involving two distinct respondent groups, namely experts and waqf practitioners. The findings indicate that the factors influencing simple productive waqf in Indonesia comprise the waqf institution, the productive waqf assets designated for development, the financing methods for the productive waqf, the management strategies of the productive waqf, and the adherence to the principles governing productive waqf. Proposed models for productive waqf include cash waqf in conjunction with a self-managed model, Islamic bank financing paired with a self-managed model, Sukuk in collaboration with external partners, cash waqf alongside external partnerships, and a combination of cash waqf, co-financing, and external partnerships. Furthermore, the most effective simple productive waqf model identified is the cash waqf combined with a self-managed approach, succeeded by the cash waqf and external partnership model, both of which demonstrate the highest achievement across various socio-economic metrics, well-being compliance, and moral/ethical considerations within the theoretical framework of the unity of knowledge, or Tawhid.

The research conducted by Laluddin et al. (2021) elucidates that philanthropic endowments or waqf constitute a form of enduring charity, characterized by potential profits or benefits intended for the spiritual and economic advancement of society. This investigation endeavors to re-examine the concept of waqf by scrutinizing its literal and technical definitions, as well as its legitimacy in accordance with the Qur'an and Sunnah. Furthermore, it explores various classical and contemporary perspectives regarding its conceptualization and traces its origins within the Islamic heritage. The concept of istibdal, which pertains to the exchange of waqf properties, is analyzed as a mechanism for ensuring the viability of waqf assets, along with the associated challenges. This paper is grounded in library research and employs qualitative methodologies. Upon thorough analysis of the pertinent data, the authors conclude that future initiatives must focus on the development of the waqf concept in alignment with maqasid shari'ah, while concurrently establishing a universal and comprehensive vision of shari'ah based on its overarching objectives. Both concepts necessitate re-examination, reflection, and refinement to rejuvenate the dynamism of the waqf

paradigm, thereby rendering it an effective instrument for poverty alleviation and equitable wealth distribution among various segments of society.

RESEARCH METHODOLOGY

Research Approach

This investigation employs a qualitative framework, utilizing case study methodologies to thoroughly comprehend the intricacies of digital green waqf development and its ramifications for social sustainability within Riau Province. The qualitative framework was selected due to its capacity to facilitate the examination of multifaceted and contextual social phenomena.

Location and Time of Research

The study was executed in Riau Province, specifically in regions characterized by waqf activities and the integration of digital technology in their administration, during the period from January to May 2025.

Informants and Sampling Techniques

The research informants comprised ten individuals who were deliberately chosen based on their engagement and pertinence to the research theme, which included nadzir waqf, scholars in sharia economics, government representatives, community leaders, practitioners in sharia fintech, and wakifs. The purposive sampling method was employed to acquire comprehensive and nuanced information.

Data Collection Techniques

Data were amassed through comprehensive interviews guided by semi-structured interview protocols, permitting informants to articulate open and narrative responses. The interviews were recorded and transcribed verbatim. Furthermore, participatory observation and the gathering of relevant documents as supplementary data were conducted.

Data Analysis Techniques

The data obtained from interviews and observations were subjected to thematic analysis, which encompassed stages of familiarization, data coding, theme categorization, and interpretation of findings. A narrative analysis approach was also implemented to expound upon each informant's perspective in detail.

Data Validity

To uphold the validity of the data, the technique of source triangulation was employed, which involved comparing data from diverse informants and collection methodologies. Moreover, member checking was performed to ensure that the researcher's interpretations align with the informants' intended meanings.

Research Ethics

The research adhered to ethical principles by securing the permission and consent of informants, safeguarding the confidentiality of their identities, and utilizing the data solely for academic purposes.

RESEARCH RESULTS AND DISCUSSION

Research Results

Perception of Individuals and Stakeholders regarding the Digital Paradigm of Green Waqf in Riau Province

Narrative Analysis per Informant

Informant 1 (Nadzir Waqf Masjid in Pekanbaru)

“The digital waqf paradigm is commendable; however, a significant portion of worshippers lacks comprehension. Particularly when the term 'green' is introduced, it becomes even more perplexing.”

Analysis:

Informants acknowledged the merit of innovation yet underscored deficiencies in worshippers' comprehension. The term “green” is perceived as lacking foundational clarity. There exists a necessity for communal education and the engagement of religious authorities to provide contextually relevant explanations of these concepts.

Informant 2 (Sharia Economics Academician)

“The concept of digital green waqf represents a significant innovation within the contemporary economic landscape. However, it necessitates elucidation through the lens of maqashid sharia to ensure its acceptance by the broader community.”

Analysis:

A religiously grounded framework is essential for the comprehensive explanation of digital green waqf. The populace's understanding of the maqashid concept can serve as a pivotal entry point. It is advisable to advocate for an approach grounded in spiritual values, rather than one that is merely technological.

Informant 3 (Employee of BAZNAS Riau Province)

“The potential for the integration of data and social initiatives of BAZNAS would yield significant benefits.”

Analysis:

There exist substantial prospects for the amalgamation of social initiatives. Such integration necessitates the interoperability of digital infrastructures and collaborative institutional efforts. This suggests a requirement for a platform capable of linking waqf with the authentic needs data of the community.

Informant 4 (Public figure — The Imam of The Mosque)

“The waqf typically comprises land or edifices. The concept of digitization remains challenging for our comprehension.”

Analysis:

Highlights the traditional conception of (tangible) waqf. The integration of digital formats is perceived as an unfamiliar concept. A visual medium or an interactive simulation is necessary for enhanced understanding.

Informant 5 (Environmental Student Activist)

“I am unequivocally in favor of environmentally sustainable digitization of waqf. It is imperative that there exists a platform accessible to the younger generation.”

Analysis:

Demonstrates robust advocacy from the youth who are environmentally conscious. There exists considerable potential for the mobilization of digital engagement via interactive platforms. They require a conduit for direct participation.

Informant 6 (Senior Wakif)

“Provided that safety is assured and benefits are clearly delineated, I am willing to proceed. Nevertheless, transparency is imperative.”

Analysis:

Traditional wakifs continue to exhibit skepticism regarding facets of digital security. Transparency and consistent reporting are essential for fostering participation. Promote public auditing and reporting technologies.

Informant 7 (the Social Service office)

“This initiative has the capacity to support RPJMD within the realms of social and environmental sectors. However, it necessitates the involvement of the government from the outset.”

Analysis:

Acknowledges the digital potential of green waqf as a strategic regional initiative. Nonetheless, it emphasizes that without formal governmental engagement, the program risks stagnation.

Informant 8 (Sharia Fintech Practitioner)

“It is imperative for waqf to be integrated into the blockchain platform. Nonetheless, the regulatory framework must be conducive.”

Analysis:

This development technically facilitates the deployment of blockchain-centric digital platforms. Nevertheless, there exist significant challenges concerning Sharia compliance and the realm of digital finance. A robust Sharia-compliant digital legal framework is essential.

Informant 9 (Housewife — Taklim Assembly)

“If there were a user-friendly application for plant waqf or solar energy, I would express interest.”

Analysis:

This indicates a favorable disposition towards environmentally oriented, tangible initiatives. There is a necessity for a straightforward interface and a form of waqf that resonates with quotidian experiences.

Informant 10 (Social Empowerment NGO)

“The digital green waqf must be firmly rooted. It should not merely exist as an elite discourse. It is crucial to engage with the grassroots.”

Analysis:

This reflects a critique of the elitism associated with the concept. It underscores the necessity for active participation of local communities in both the design and execution processes. A community-oriented participatory approach is required.

Table 1
Thematic Qualitative Coding Regarding The Digital Paradigm Of Green Waqf
In Riau Province

Main Themes	Sub-Themes / Coding	Related Informants
Literacy & Understanding	Low understanding of digital Waqf	1, 4
	The need for a Shariah-compliant approach	2
Technological Readiness	The potential of digital platforms & blockchain	5, 8
	Green Waqf application accessibility	5, 9
Trust & Transparency	Audit & reporting system requirements	6, 7
Synergy Between Institutions	Need integration with zakat institutions & government	3, 7
Socio-Environmental Context	Support on real green waqf project	5, 9
	Innovation exclusivity concerns	10

The concept of digital green waqf exhibits significant promise in Riau, particularly concerning the religious ethos of the local populace and the escalating environmental challenges. Nonetheless, there exists a notable literacy disparity, particularly among non-digital communities and the elder demographic. The collaboration among various stakeholders (including nadzir, governmental entities, fintech organizations, and the community at large) is crucial for the realization of digital green waqf, ensuring it transcends mere elite discourse and genuinely addresses the societal needs while fostering social sustainability.

Opportunities and Obstacles in The Advancement of Digital Green Waqf For The Purpose Of Social Sustainability in Riau

Narrative Analysis per Informant

Informant 1 (Nadzir Waqf Masjid in Pekanbaru)

"If a framework for the management of these digital waqs is established with transparency and consistent reporting mechanisms, it is plausible that numerous waqfs will emerge. However, we, as nadzir, continue to experience uncertainty regarding the practical implementation of such a framework."

Analysis:

Opportunities: Transparency and systematic reporting foster trust among wakif stakeholders.

Challenges: The institutional capabilities of nadzir remain insufficient concerning the realms of digitization and sustainable project management.

Informant 2 (Sharia Economics Academician)

"The notion is significantly pertinent to the worldwide movement towards sustainable waqf. However, within the context of Indonesia, there remains a deficiency in both human capital and the requisite digital infrastructure within the region."

Analysis:

Opportunities: Pertinence to global concerns (green economy, Environmental, Social, and Governance criteria, maqashid). Challenges: Constraints related to human resources and technological infrastructure, particularly in areas beyond major urban centers.

Informant 3 (Employee of BAZNAS Riau Province)

“If it is feasible to amalgamate with zakat and corporate social responsibility initiatives, we could potentially enhance the mobilization of financial resources. However, one must exercise caution regarding regulatory frameworks.”

Analysis:

Opportunities: Convergences of Islamic social funding mechanisms (zakat—CSR—Waqf). Challenges: The ambiguity inherent in regulatory stipulations and the constraints of institutional jurisdiction.

Informant 4 (Public figure — The Imam of The Mosque)

“In our village, numerous parcels of wasteland designated as waqf exist. With the provision of assistance and appropriate training, it is conceivable that these areas could be revitalized into arable green spaces.”

Analysis:

Opportunities: The latent waqf assets present significant potential for optimization within green initiatives. Challenges: There exists a deficiency in knowledge, technical resources, and training for the local community.

Informant 5 (Environmental Student Activist)

“Young individuals exhibit a propensity for engagement when the principles of transparency are upheld and the advantages are unequivocally articulated. Our contribution can enhance the effectiveness of the digital campaign.”

Analysis:

Opportunities: The engagement of younger demographics in digital initiatives and fundraising endeavors. The challenge: It is imperative to establish a digital platform that is both accessible and trustworthy.

Informant 6 (Senior Wakif)

“I am inclined to support the establishment of a waqf, provided there is unequivocal transparency regarding the allocation of funds and the possibility of conducting audits. However, I lack familiarity with the digital application.”

Analysis:

Opportunities: Individuals engaged in waqf are inclined to contribute, contingent upon assurances of transparency and comprehensibility. Challenges: There exists a deficiency in digital literacy among senior officials, compounded by an absence of automated reporting mechanisms.

Informant 7 (the Social Service office)

“The government possesses the capacity to facilitate community empowerment initiatives. However, it is imperative that a tangible pilot project is implemented, rather than merely proposing a theoretical concept.”

Analysis:

Opportunities: Local governmental entities exhibit a willingness to provide support in alignment with social and environmental policy frameworks. Challenge: There exists a pressing necessity for a substantive pilot initiative in practice to ensure progression beyond mere theoretical constructs.

Informant 8 (Sharia Fintech Practitioner)

“Smart contracts possess the potential to enhance transparency and operational efficiency. However, the concept of blockchain technology remains insufficiently comprehended by regulatory bodies and oversight authorities.”

Analysis:

Opportunities: Innovations like smart contracts and blockchain technology significantly augment efficiency and foster trust. Challenges: There exist notable deficiencies in comprehension and an absence of targeted regulatory frameworks for digital waqf.

Informant 9 (Housewife — Taklim Assembly)

“I aspired to establish a plant waqf; however, in the absence of a designated manager, we experienced considerable uncertainty. It is imperative that a mentoring framework is instituted.”

Analysis:

Opportunities: There exists a substantial community engagement concerning environmentally-oriented waqf initiatives (such as trees and renewable energy). Challenges: There is a notable deficiency in both management and mentorship pertaining to project oversight.

Informant 10 (Social Empowerment NGO)

“The notion is commendable. However, in the absence of inclusivity, it risks being dominated by the privileged few. It is imperative that grassroots communities assume a central role in this discourse.”

Analysis:

Opportunities: The facilitation of local community empowerment as proactive agents within the waqf framework. Challenges: The potential for exclusivity and the occurrence of non-participatory methodologies in both planning and implementation phases.

Table 2
Thematic Qualitative Coding Regarding Opportunities and Obstacles in The Advancement of Digital Green Waqf For The Purpose Of Social Sustainability in Riau

Main Themes	Sub-Themes / Coding	Related Informants
Opportunities	Technology-based transparency	1, 5, 6, 8
	Synergy of Islamic Social Fund	3
	Waqf land potential and local resources	4
	Support of young people and NGOs	5, 10
	Local government involvement	7
Challenges	Digital literacy nadzir and senior vice president	1, 6, 8
	Lack of human resources and community training	2, 4, 9
	Regulation does not support	3, 8
	Risk of exclusivity of ideas	10
	The need for a pilot project	7

The advancement of digital green waqf in Riau presents a significant opportunity to foster social sustainability, bolstered by the engagement of the youth, the unexploited potential of waqf assets, and the readiness of digital technologies. Nevertheless, the realization of this initiative encounters formidable obstacles, including inadequate digital literacy, regulatory constraints, and a dearth of tangible models that can be effectively replicated. Consequently, a cooperative strategy, community-oriented pilot initiatives, and the fortification of waqf institutions are imperative for the successful and sustainable execution of this endeavor.

The Involvement Of Stakeholders In Facilitating The Execution Of Digital Green Waqf Initiatives For The Promotion Of Social Sustainability In The Riau Region.

Narrative Analysis per Informant

Informant 1 (Nadzir Waqf Masjid in Pekanbaru)

“We, as Nadzir, unequivocally express our desire to engage in the process; however, we require comprehensive technical guidance and explicit regulatory clarity. At times, it appears as though we are undertaking our responsibilities in isolation, devoid of necessary coordination.”

Analysis:

Role: Principal executor of waqf asset management. Issue: Insufficient technical and regulatory support from various stakeholders. Challenges: Deficiency in cross-agency collaboration and mentorship.

Informant 2 (Sharia Economics Academician)

“Academics possess the capacity to significantly contribute to empirical inquiries, the formulation of educational frameworks, and the innovative design of digital representations. Nevertheless, it is imperative that we are provided with the necessary support to ensure that the findings derived from such scholarly investigations can be effectively implemented.”

Analysis:

Role: Source of theoretical understanding and conceptual frameworks. Issue: Insufficient connections between scholarly research and practical application in the field. Opportunities: Enhancing the position of academics as collaborators grounded in knowledge-based partnerships.

Informant 3 (Employee of BAZNAS Riau Province)

“We are prepared to provide assistance should there exist a digital infrastructure amenable to integration; however, it is imperative that we exercise caution due to the distinct regulatory frameworks governing zakat and waqf.”

Analysis:

Role: Administrators of prospective Islamic social funds for collaborative synergies. Issue: Constraints of authority among social finance entities. Opportunities: Prospective amalgamation of data, programs, and digital platforms.

Informant 4 (Public figure — The Imam of The Mosque)

“Society possesses the potential to engage proactively when there exists effective socialization and well-defined advantages. Presently, numerous initiatives are conducted in a digital format; however, they often present complexities.”

Analysis:

Role: Beneficiary agent as well as local implementer. Issue: Deficiency in technical comprehension and participatory discourse. Opportunities: Community-oriented socialization may enhance the efficacy of implementation.

Informant 5 (Environmental Student Activist)

"We are equipped to provide assistance in digital marketing strategies, education pertaining to social media platforms, or actively participate in the initiative to support the green waqf campaign."

Analysis:

Role: Catalyst for change and digital marketing advocate. Issue: Requirement for access and legal support to engage in formal involvement. Opportunities: The youth demographic possesses the potential to serve as primary drivers of technology-facilitated social innovation.

Informant 6 (Senior Wakif)

"I seek to ascertain the identity of the individuals responsible for the administration of my waqf, as well as the mechanisms in place for accountability. Who oversees and guarantees that the operations adhere to the principles of sharia?"

Analysis:

Role: Contributor of financial resources or assets. Issue: Ambiguity in governance, oversight, and accountability among stakeholders. Opportunity: There exists a necessity for a framework of public oversight and compliance with sharia principles.

Informant 7 (the Social Service office)

"We possess the capacity to enhance policy frameworks; however, the impetus must originate from the grassroots level. It is imperative to achieve a unified approach among all relevant stakeholders."

Analysis:

Role: Provider of facilitative policy measures and regulatory assistance. Issues: Insufficient grassroots consolidation and inter-agency collaboration. Opportunity: The government can serve as a synergistic conduit among diverse actors.

Informant 8 (Sharia Fintech Practitioner)

"We possess the requisite technological capabilities; however, collaboration with waqf agencies and regulatory bodies is imperative for conducting trials. It is imperative that we do not undertake this endeavor in isolation."

Analysis:

Role: Provider of advanced digital technologies and innovative solutions. Issue: A comprehensive digital waqf ecosystem has yet to be established. Opportunities: The urgent necessity for fintech synergies with nadzir and governmental entities is evident.

Informant 9 (Housewife — Taklim Assembly)

"If our involvement had commenced at the outset, it would have constituted a fervent commitment. However, there are instances where the engagement is limited solely to the initiation phase, resulting in a subsequent lack of clarity."

Analysis:

Role: Social catalyst rooted in community engagement. Issue: Absence of prolonged participatory involvement. Opportunities: An inclusive methodology that enhances the agency of women's collectives.

Informant 10 (Social Empowerment NGO)

“We are prepared to assist in the oversight and engagement of the community. However, it is imperative that there exists a degree of transparency and explicitness regarding the responsibilities of each party involved.”

Analysis:

Role: Autonomous overseer and community mediator. Issue: A multiparty coordination and reporting framework has yet to be established. Opportunities: Non-governmental organizations have the capacity to function as vigilant observers and social conduits.

Table 3

Thematic Qualitative Coding Regarding The Involvement Of Stakeholders In Facilitating The Execution Of Digital Green Waqf Initiatives For The Promotion Of Social Sustainability

Stakeholder Roles	Examples Of Special Roles	Sources Of Informants
Nadzir & Waqf Board	Asset Management and distribution of Waqf	1, 3
Academician	Research providers, policy models, and education	2
Local Government	Policy facilitator, coordinating liaison	7
Fintech & Digital Technology	System developer, platform, smart contract	8
General Public & Wakif	Asset giver, benefit user, social supervisor	4, 6, 9
Young Generation & Students	Digital campaign and Education Agency	5
NGOs and local communities	Independent Monitoring and social facilitators	10

The execution of a digital green waqf initiative aimed at promoting social sustainability within Riau necessitates the engagement of multiple stakeholders in a coordinated manner. The effectiveness of each participant’s contribution is suboptimal due to the presence of fragmentation, communication barriers, and the lack of a standardized framework for collaboration and accountability.

Stakeholders including nadzir, governmental entities, financial technology firms, and community members occupy pivotal roles, yet this potential must be cultivated through an inclusive collaborative framework grounded in the principles of transparency, participation, accountability, and social technological innovation. In the absence of a robust coordination and participation framework, the digital capabilities of green waqf remain unrealized to their fullest extent.

The Impediments And Barriers Encountered In The Advancement Of Digital Green Waqf For The Promotion Of Social Sustainability In Riau

Narrative Analysis per Informant

Informant 1 (Nadzir Waqf Masjid in Pekanbaru)

“Our primary challenge resides in the insufficient comprehension of digital technology among community members and mosque administrators. Furthermore, financial constraints impede the implementation of technological solutions.”

Analysis:

The predominant hindrance manifests as inadequate digital literacy among both administrators and the general populace. Financial resource limitations present a tangible barrier to successful implementation.

Informant 2 (Sharia Economics Academician)

“The absence of specific and comprehensive regulations pertaining to the digitization of waqf constitutes a significant impediment. Additionally, there is an emerging cultural resistance to technological advancements.”

Analysis:

Regulatory challenges have proven to be unresponsive to the evolving digitization landscape of waqf. Socio-cultural hindrances are evident in the prevailing lack of commitment to embracing innovative technologies.

Informant 3 (Employee of BAZNAS Riau Province)

“The absence of a cohesive system linking waqf institutions with sharia fintech has severely obstructed the execution of digital green waqf initiatives.”

Analysis:

There exists a deficiency in the integration of systems between relevant institutions and technological platforms. Challenges arise in terms of coordination and interoperability among different platforms.

Informant 4 (Public figure — The Imam of The Mosque)

“Individuals encounter significant difficulties in accessing technology due to the disparity in internet connectivity, particularly in rural locales.”

Analysis:

Barriers in digital infrastructure constitute the principal obstacles to equitable access for individuals. There exists a pronounced digital divide between urban and rural areas.

Informant 5 (Environmental Student Activist)

“There is a conspicuous deficiency in funding support and a lack of qualified human resources dedicated to the development of digital waqf applications.”

Analysis:

There is an insufficiency of financial resources allocated for research and development, as well as for digitalization efforts. Furthermore, there exists a limitation in the availability of personnel well-versed in waqf technology.

Informant 6 (Senior Wakif)

“I harbor apprehensions regarding data security and the transparency of digital waqf management, fearing the potential for fraudulent activities.”

Analysis:

Concerns regarding cybersecurity and transparency are emerging as psychological impediments for prospective donors. It necessitates the assurance of a reliable and credible system.

Informant 7 (the Social Service office)

“The bureaucratic inertia and protracted digital licensing processes significantly impede the advancement of digital waqf innovation.”

Analysis:

Prolonged and inflexible bureaucratic and regulatory challenges hinder progress. There exists a notable absence of expeditious permit processing and the adaptation of innovative policies.

Informant 8 (Sharia Fintech Practitioner)

“The insufficient awareness of waqf institutions concerning the advantages of technological advancements complicates the establishment of partnerships with fintech entities.”

Analysis:

Barriers to the adoption of technology are prevalent among waqf institutions. There are considerable challenges in fostering collaborative synergies with fintech organizations.

Informant 9 (Housewife — Taklim Assembly)

“We encounter significant difficulties in comprehending digital applications, especially those based on blockchain or smart contracts, necessitating extensive training.”

Analysis:

There exist barriers to technological literacy among the general populace. Continuous training and mentoring are imperative.

Informant 10 (Social Empowerment NGO)

“The absence of transparency and the lack of publicly accessible reports constitute significant obstacles to public scrutiny and engagement.”

Analysis:

Challenges in accountability and transparency serve to diminish public trust. An open and accessible reporting system is required.

Table 4

Thematic Qualitative Coding Regarding The Impediments And Barriers Encountered In The Advancement Of Digital Green Waqf For The Promotion Of Social Sustainability In Riau

Categories Of Barriers	Examples Of Barriers	Informant
Digital Literacy	Lack of technical knowledge, lack of training	1, 9
Regulation and bureaucracy	Unclear regulation, slow licensing	2, 7
Digital Infrastructure	Uneven internet network	4
Resources and funds	Lack of funds and competent human resources	1, 5
Security and transparency	Data security and accountability concerns	6, 10
Integration and Synergy	Lack of integrated systems and partnerships	3, 8

The primary obstacles encountered in the progression of digital green waqf within Riau are:

1. Deficiencies in digital literacy and comprehension among nadzir and the broader community.
2. Inadequacies in technological infrastructure and Internet connectivity, particularly in rural regions.
3. Ambiguous regulatory frameworks and sluggish bureaucratic processes impede innovation and advancement.
4. Shortcomings in human capital and financial resources for the development and operationalization of technology.

5. Apprehensions regarding data security and the transparency of digital waqf administration diminish the confidence of stakeholders in the waqf.
6. The absence of systemic integration and collaborative partnerships between waqf institutions and fintech entities presents a significant technical barrier.

Expectations And Recommendations Of Stakeholders Towards The Development Of Digital Green Waqf To Support Social Sustainability In Riau

Narrative Analysis per Informant

Informant 1 (Nadzir Waqf Masjid in Pekanbaru)

“I aspire that this digital green waqf facilitates the organization and management processes for individuals with enhanced transparency. I advocate for the implementation of regular training sessions and governmental support to ensure the effective utilization of the technology.”

Analysis:

The aspiration highlights the importance of accessibility and the transparency of management practices. There are robust recommendations focusing on the necessity of continuing education and regulatory support.

Informant 2 (Sharia Economics Academician)

“I envision that the digital green waqf can serve as an innovative paradigm that amalgamates Sharia principles with contemporary technology. My recommendation is for the establishment of continuous research and regulatory frameworks that adapt to technological advancements.”

Analysis:

There is a vision for the convergence of Sharia and technology as a novel model of innovation. The recommendations emphasize the significance of academic research and responsive policy-making.

Informant 3 (Employee of BAZNAS Riau Province)

“The digital green waqf has the potential to broaden the outreach of waqf, particularly among the younger demographic. I suggest fostering collaborations with financial technology firms and private entities to expedite developmental progress.”

Analysis:

There is an expectation that digitalization will resonate with the millennial population. The recommendations advocate for the enhancement of multi-stakeholder partnerships.

Informant 4 (Public figure — The Imam of The Mosque)

“Our aspiration is that this technology can yield tangible benefits for the village community through enhanced accessibility. It is our recommendation that direct training initiatives be implemented within the village, alongside the development of supportive infrastructure facilities.”

Analysis:

There is an aspiration for immediate social advantages and improved accessibility for the village populace. Concrete recommendations are presented in the form of localized training and infrastructure enhancements.

Informant 5 (Environmental Student Activist)

“The digital green waqf must substantively support environmental conservation initiatives. I propose that the digital waqf be integrated with a clearly defined and transparent environmental program.”

Analysis:

Expectations surrounding the digital waqf are associated with its potential positive environmental ramifications. Recommendations focus on the integration of waqf with activities aimed at environmental preservation.

Informant 6 (Senior Wakif)

“I desire for the digital green waqf to guarantee the security of funding and facilitate ease of access. The recommendation entails that the system must be characterized by transparency and an open auditing mechanism.”

Analysis:

Expectations pertain to the dimensions of security and accessibility. Recommendations emphasize the necessity of transparency and auditing as mechanisms to foster trust.

Informant 7 (the Social Service office)

“We anticipate that the digital green waqf will enhance synergies among government entities, societal members, and waqf organizations. Our recommendation is to formulate supportive regulatory frameworks and implement intensive socialization programs.”

Analysis:

There is an expectation for synergies among multiple stakeholders. The recommendations underscore the importance of regulatory measures and socialization efforts.

Informant 8 (Sharia Fintech Practitioner)

“Our aspiration is for the digital green waqf to represent an inclusive innovation within the fintech landscape. Our advice is to persist in the development of user-friendly technological features and broaden market access.”

Analysis:

There is an aspiration for an inclusive and accessible fintech innovation. Recommendations advocate for the enhancement of feature development and the expansion of access.

Informant 9 (Housewife — Taklim Assembly)

“My aspiration is for digital waqf technology to be comprehensible and to facilitate our more active participation. I recommend the provision of intensive mentorship and the use of simplified language.”

Analysis:

There is an aspiration for simplicity and active participation. Recommendations call for mentorship initiatives and the simplification of technological language.

Informant 10 (Social Empowerment NGO)

“We aspire that this digital waqf can function as a transparent platform to bolster genuine social and environmental initiatives. Our recommendations include the provision of accessible reports and the involvement of the community in oversight activities.”

Analysis:

Expectations revolve around transparency and a pronounced socio-environmental impact. Recommendations advocate for public reporting and community participation in oversight processes.

Table 5

Thematic Qualitative Coding Regarding Expectations And Recommendations Of Stakeholders Towards The Development Of Digital Green Waqf To Support Social Sustainability In Riau

Main Themes	Expectations	Recommendations
Ease of access and participation	Digital waqf is easy to use & access	Regular training, intensive mentoring
Transparency and security	Secure funds and transparent management	Open audits, easily accessible reports
Synergy and collaboration	Strong multi-party synergy	Fintech, government, community
Integration of Sharia and Technology	Innovation in accordance with Sharia principles	Sustainable research and adaptive policy
Social and environmental impact	Waqf supports social and conservation	Integration of environmental and social programs

Discussions

Perception of Individuals and Stakeholders regarding the Digital Paradigm of Green Waqf in Riau Province

Overview of Informants

The research encompassed a cohort of 10 informants hailing from diverse professional domains, including nadzir waqf, scholars, prominent public figures, wakifs, youthful activists, representatives from governmental bodies, practitioners in the fintech sector, and members of women's organizations. Comprehensive interviews were undertaken to explore their insights and perceptions regarding the digital paradigm of green waqf.

Key Findings Based on Research Question 1

“How do individuals and relevant stakeholders conceptualize the notion of digital green waqf within the context of Riau Province?”

1. Community Literacy Rate

A majority of informants articulated that the populace's comprehension of digital waqf remains markedly deficient, particularly concerning the concept of green waqf as it pertains to ecological considerations.

“The notion of digital waqf alone is not well understood, particularly when the term 'green' is introduced. It becomes rather alien.” (Informant 1)

“If it is elucidated through the maqashid of sharia and the principles of Islam, I believe it would be more readily accepted.” (Informant 2)

Analysis:

The observed low literacy levels can be attributed to insufficient socialization efforts, constrained access to pertinent information, and the entrenched traditional perception of waqf as a tangible entity, such as land or edifices. Consequently, the implementation of a contextual educational approach is rendered critically significant.

2. Enthusiasm of the Young Generation

The younger demographic, particularly those engaged in environmental and technological discourse, exhibits a pronounced enthusiasm for the notion of digital green waqf.

"There exists a necessity for a digital platform to facilitate the younger generation's involvement in the energy or tree waqf." (Informant 5)

Analysis:

This underscores the considerable potential of indigenous digital participation in the reformation of waqf towards a digital and ecologically sustainable paradigm. It necessitates the incorporation of interactive media and a user-friendly interface.

3. Trust and Transparency

Several respondents emphasized the critical significance of trust components within the waqf digital platform, particularly regarding the safeguarding of funds and the clarity of reporting mechanisms.

"If the reporting is safe and clear, I will go. But don't let the money disappear or not know where to go." (Informant 6)

Analysis:

Public confidence may be cultivated through transparent, real-time reporting frameworks, exemplified by blockchain-based dashboards.

4. Role of Government and Sharia Institutions

The program was methodically evaluated to align with local governmental social and environmental initiatives; however, it necessitated collaborative engagement from various stakeholders from the initial planning phase.

"Digital green waqf can be included in regional programs, but the government must be invited from the beginning." (Informant 7)

Analysis:

The interplay between the public sector, sharia institutions, and technological entities will be pivotal in determining the effectiveness of the green waqf digital ecosystem.

5. Social Justice and Inclusivity

Apprehensions emerge if this concept is solely developed by elite groups without engaging grassroots communities.

"Not only do the academic elite understand, but they should touch the ones below as well." (Informant 10)

Analysis:

Inclusivity and active community involvement are essential tenets to ensure that digital green waqf genuinely serves as a solution for social sustainability.

Implementation Challenges

1. Insufficient Digital Literacy Among the General Population

A significant impediment to the effective implementation of technology-driven Green Waqf initiatives is the prevailing low level of digital literacy within the community. Numerous potential wakif (waqf donors) as well as traditional waqf administrators lack familiarity with advanced technologies such as blockchain, smart contracts, or asset tokenization. This lack of awareness adversely affects:

- a. Minimal community engagement in digital waqf initiatives.
 - b. Skepticism towards technology-based systems, perceived as intricate or prone to fraudulent activities.
 - c. Challenges in accessing and leveraging the digital platforms available.
 - d. Digital literacy encompasses not merely technical proficiency but also ethical considerations, data protection, and confidence in emerging technological frameworks.
2. Absence of Specific Regulations Pertaining to Green Waqf and Blockchain Technology
- Currently, there exists no legal framework that distinctly governs the administration of waqf through an environmentally sustainable approach leveraging technologies such as blockchain in Indonesia. The ramifications of this regulatory gap include:
- a. Ambiguity regarding the legal status of digital waqf and the legal safeguards for wakifs and nadzirs.
 - b. Indeterminacy in the governance and accountability of digital waqf assets.
 - c. Challenges in integrating digital waqf platforms with sharia financial institutions or governmental bodies.
 - d. Regulatory frameworks that fail to respond to digital innovation hinder the legitimacy and scalability of technology-driven green waqf initiatives.
3. Ineffective Coordination Among Waqf Management Entities
- In Indonesia, the administration of waqf involves a multitude of institutions, including the BWI (Indonesian Waqaf Agency), local nadzirs, sharia financial institutions, and community organizations. Nonetheless, the coordination among these entities remains inadequate, as evidenced by:
- a. Redundancies in programs and data.
 - b. The lack of a cohesive system for the reporting, oversight, and evaluation of waqf management.
 - c. Insufficient collaboration in developing innovative waqf models, such as technology-enabled green waqf.
 - d. The deficiency in coordination obstructs the standardization of systems and diminishes the efficacy of interagency cooperation.
4. Risk of Program Exclusivity Benefiting Only Specific Groups

Technology-driven Green Waqf initiatives face the risk of being exclusive, accessible solely to:

- a. Urban populations well-versed in digital technologies.
- b. Communities possessing advanced understanding of social and environmental investment principles.
- c. Large organizations equipped with adequate technological and financial means.

This exclusivity could engender a disparity in participation and exacerbate inequalities in access to waqf benefits, which should ideally be inclusive and equitable for all demographics.

The aforementioned challenges illustrate that the successful implementation of blockchain-based Green Waqf necessitates not only technological innovation but also a comprehensive approach that encompasses the enhancement of digital literacy, regulatory reform, institutional fortification, and strategies

for social inclusion. Failure to address these critical issues will impede the attainment of the Green Waqf's overarching objectives of social and environmental sustainability.

Strategic Opportunities

1. Robust endorsement from the youth demographic and the ecological community
The contemporary younger generation exhibits a profound level of awareness regarding environmental and societal concerns. A considerable proportion of this demographic is also increasingly adept at utilizing digital technology and demonstrates a propensity to endorse innovative initiatives that yield beneficial outcomes, including:
 - a. A fervent commitment to the principle of sustainability-oriented productive waqf.
 - b. A willingness to engage through digital interfaces such as mobile applications and tokenization frameworks.
 - c. Initiatives spearheaded by green communities and youth organizations aimed at fostering tangible actions in the environmental sector.This endorsement cultivates a formidable participant base and functions as a catalyst for change in the advancement of Green Waqf as a digitally-oriented social-ecological movement.
2. Integration Prospects with Regional Social Policy
Regional Medium Term Development Plans across various provinces in Indonesia have commenced the incorporation of sustainability and green economic dimensions as pivotal developmental priorities. This development creates strategic avenues for the integration of Green Waqf as an integral component of:
 - a. Religious social asset-driven poverty alleviation initiatives.
 - b. Environmental endeavors encompassing afforestation, clean water management, and renewable energy initiatives.
 - c. Economic empowerment initiatives for local communities predicated on Islamic social financing.This collaborative synergy fortifies the position of Green Waqf within regional development governance frameworks and stimulates support from local governmental entities.
3. Technological Preparedness (Blockchain, Smart Contracts, Mobile Applications)
In the present day, the digital technology infrastructure is attaining greater sophistication and accessibility for both the general populace and the institutions administering waqf. Technologies such as:
 - a. Blockchain facilitate transparency, security, and accountability within the management of waqf financial resources.
 - b. Smart contracts enable the automatic execution of sharia-compliant waqf agreements without the necessity for intermediaries.
 - c. Mobile applications afford seamless access for wakifs, nadzirs, and communities to engage, contribute, and oversee waqf initiatives.This technological preparedness constitutes a critical asset for extending outreach, enhancing public trust, and streamlining waqf governance mechanisms.
4. Potential Synergies with Zakat, CSR, and Other Social Financial Instruments
Green Waqf possesses significant potential for synergistic integration with other social funding mechanisms, including:

- a. Zakat, particularly for the ongoing empowerment of mustahik through productive waqf assets.
- b. Corporate Social Responsibility (CSR) initiatives that are increasingly focused on endorsing sustainable and ecologically responsible projects.
- c. Manageable infaq and charitable contributions within a unified framework to bolster social and ecological development.

This synergy amplifies the scale and impact of the programs while fostering a mutually supportive socio-economic ecosystem for the betterment of society.

The aforementioned strategic opportunities illustrate that Green Waqf transcends mere conceptual idealization and holds substantial promise for practical implementation. The backing of the younger generation, technological preparedness, policy synergies, and the potential for integration with complementary social funding sources represent formidable forces propelling the transformation of waqf from conventional systems toward a more inclusive, transparent, and sustainable digital paradigm.

Development Recommendations

1. Public Education on Digital Green Waqf Based on Islamic Values

An essential preliminary measure involves enhancing public cognizance and comprehension of the Digital Green Waqf concept. This educational initiative should:

- a. Utilize methodologies rooted in Islamic values, including trust, maslahat, and sustainability (istikhlaf).
- b. Be conveyed in a manner that is comprehensible to a diverse demographic, encompassing religious leaders, the youth, and the general populace.
- c. Employ digital media formats (such as webinars, infographics, and educational videos) alongside traditional media avenues (including studies and Friday sermons) to achieve broader outreach.

The objective is to cultivate a collective consciousness recognizing that waqf transcends mere worship, serving as a contemporary instrument for social and environmental advancement.

2. Developing an Inclusive, Transparent, and Easy-to-Use Digital Platform

The efficacy of the digitization of Green Waqf is significantly contingent upon the digital platforms that facilitate it. This platform should:

- a. Be inclusive, ensuring accessibility for individuals from all socioeconomic backgrounds without necessitating advanced technical proficiency.
- b. Exhibit transparency, encompassing features such as real-time reporting, digital auditing, and tracking of waqf fund allocations.
- c. Be user-centric, employing an intuitive interface and vernacular suited to the local cultural context.

The creation of mobile applications integrated with sharia-compliant digital wallets and systems for waqf asset tokenization is poised to markedly enhance community engagement.

3. Establishing a Collaborative Ecosystem between Nadzir, Sharia Fintech, and the Government

The administration of Green Waqf necessitates the collaborative synergy of multiple stakeholders, including:

- a. Nadzir, who, as waqf managers, must be professionally developed and receptive to technological advancements.
- b. Sharia fintech, which can furnish the digital financial infrastructure and secure transaction systems.

- c. Government entities should function as facilitators, incentivizers, and providers of supportive regulatory frameworks.

Such ecosystems must be architected to promote cooperation rather than rivalry, thereby cultivating trust among all involved parties.

4. Advocating Green Waqf Digital Regulation through Fatwa and Formal Legal Umbrella

To ensure the legitimacy of the implementation of digital-based Green Waqf, it is imperative to:

- a. Secure an MUI fatwa that affirms the permissibility of employing Sharia-compliant technologies such as blockchain and smart contracts for waqf management.
- b. Obtain formal regulatory endorsement from governmental authorities, including the Ministry of Religious Affairs, OJK, or BWI, concerning the governance of digital waqf.
- c. Develop standardized SOPs, digital audit protocols, as well as data security measures and protections for vicarious rights.

Such regulations are vital for fostering public trust and safeguarding the interests of all stakeholders within the digital waqf ecosystem.

5. Initiation of Pilot Project in Masjid Masjid and Local Communities in Riau as a Replication Model

To substantiate the effectiveness of the digital Green Waqf model, it is essential to engage in tangible implementation through:

- a. A pilot project conducted in prominent mosques that boast an active congregation and robust waqf management systems.
- b. Engagement with local communities in Riau, recognizing the province's abundant socio-religious capital and its burgeoning sharia economic innovations.
- c. The evaluation and documentation of project outcomes that can serve as a model for national replication in other regions.

This pilot initiative serves as definitive evidence that the Digital Green Waqf concept is viable and capable of yielding significant societal impact.

The aforementioned five recommendations constitute a cohesive and comprehensive strategy. Spanning education and technology to regulation and practical application, if executed consistently and collaboratively, Digital Green Waqf has the potential to emerge as a pioneering innovation in the realization of sharia-based sustainable development and public engagement within the digital era.

Opportunities and Obstacles in The Advancement of Digital Green Waqf For The Purpose Of Social Sustainability in Riau

Overview of Informants

Derived from the findings obtained through interviews conducted with ten informants, it was determined that the perceptions regarding opportunities and challenges associated with the evolution of digital green waqf exhibit considerable variability, contingent upon the professional background and experiential history of each informant.

Green Waqf Digital Development Opportunities

Numerous strategic opportunities have been identified as a result of the interview findings, which include:

1. Technology-Based Transparency and Accountability ; The informant evaluated that the advent of digitization—encompassing smart contracts and blockchain technology—has the potential to enhance public trust in waqf systems, as it facilitates real-time and non-manipulative reporting.
2. Enthusiasm of the Young Generation and the Social Community ; Youth activists and local organizations exhibit a readiness to engage in the advocacy and administration of digital green waqf initiatives, which may encompass campaigns, educational endeavors, and the development of digital content.
3. Potential Synergies of Waqf with Other Social Funds (Zakat and CSR) ; The integration of waqf with zakat programs, corporate social responsibility (CSR), and community social funds is perceived as a means to augment the financing capabilities of green waqf projects.
4. Land Utilization of Sleeping Waqf for Green Projects; In various locales within Riau, numerous waqf assets remain unproductive. The digital green waqf initiative could serve as an effective means to mobilize the sustainable and efficient utilization of such dormant assets.
5. Support of Local Government and Social Regulation; Local governmental entities have exhibited a notable interest in the incorporation of green waqf initiatives as integral components of environmental policies and the empowerment of local communities.

Green Waqf Digital Development Challenge

1. Insufficient Digital Literacy Among Nadzir and Traditional Wakif; A considerable number of nadzir are currently lacking comprehension of digital systems and blockchain technology, thereby rendering them ill-prepared for adaptation.
2. Lack of Specialized Regulatory Framework; The current absence of a regulatory framework that governs the amalgamation of waqf with technological advancements and environmentally sustainable projects has resulted in institutional hesitance to engage.
3. Deficiency of Pilot Model (Pilot Project); In the absence of a tangible project, individuals encounter challenges in comprehending and placing trust in the notion of digital green waqf.
4. Constraints of Human Resources and Infrastructure in the Region; The caliber of human resources and digital infrastructure remains unevenly distributed across various locales, particularly within rural or suburban communities.
5. Threats of Access Inequality and Program Exclusivity; Should digitization not be proactively addressed, there exists a risk that grassroots groups could be marginalized from participation in the program.

According to the research findings, the potential for the advancement of digital green waqf in Riau appears to be substantially favorable, contingent upon the establishment of synergy among technological advancements, waqf institutions, community engagement, and governmental support. This observation corroborates the theoretical framework of stakeholder engagement and collaborative governance within the context of digital-oriented Islamic philanthropic administration.

Several of these prospects are reinforced by: The preparedness of technology (fintech, blockchain). The backing of a digitally literate and environmentally aware younger demographic. The necessity for alternative financing mechanisms that promote social and ecological sustainability.

Nonetheless, the challenges encountered underscore the imperative for a systematic approach: The institutional capability of nadzir necessitates enhancement through comprehensive digital and managerial training initiatives. Regulatory frameworks must evolve to encompass innovative forms of technology-

driven waqf and environmental initiatives. There is a requisite for a tangible pilot project at the local tier to validate the efficacy of the program.

Theoretically, these findings broaden the theoretical framework of Islamic Social Finance and Green Economy paradigms within local contexts, while also incorporating a dimension of digital transformation into the discourse surrounding contemporary waqf. In practical terms, this serves as a critical foundation for: Formulating a strategic roadmap for a digital green waqf policy. Creating an inclusive digital platform. Involving all relevant stakeholders, including women's groups and rural populations.

The following are the critical elements involved in the formulation of the digital green waqf model aimed at achieving social sustainability in Riau:

1. Digital Literacy and Education; Instruction for nadzirs, wakifs, and community members grounded in Islamic principles and sustainable practices.
2. Green Waqf Digital Platform; Incorporates features such as transparency through dashboards, the implementation of smart contracts, real-time auditing reports, and the integration of participatory gamification.
3. Multi-actor partnership; Involves a collaborative effort between governmental entities, nadzirs, local communities, sharia-compliant fintech organizations, and academic institutions.
4. Regulation and Supporting Policies; Promoting the establishment of digital fatwas related to green waqf and advocating for regulatory frameworks at both regional and ministry levels.
5. Pilot Project Inclusive; Conducting experimental initiatives on community-managed unproductive waqf lands utilizing digital management techniques.

The Involvement Of Stakeholders In Facilitating The Execution Of Digital Green Waqf Initiatives For The Promotion Of Social Sustainability In The Riau Region.

From the results of interviews conducted with ten informants representing diverse backgrounds, it was ascertained that the digital execution of green waqf is substantially contingent upon the synergistic interactions among multiple actors. The following presents a thematic analysis grounded in the narratives provided by each informant.

Findings Based on Research Question 3

“What is the role of stakeholders in supporting the implementation of digital green waqf for social sustainability in Riau?.

Role and Stakeholder Engagement

1. Waqf and Nadzir Institution; Nadzir institutions are pivotal in the stewardship of waqf assets. Nevertheless, insights from interviews (Informants 1 and 3) disclosed that a significant number of nadzirs remain impeded by inadequate digital literacy, the absence of comprehensive guidelines for the execution of digital waqf, and a deficiency in inter-institutional coordination.
2. Academics and Colleges; Academics (Informant 2) possess substantial potential to serve as sources for scientific inquiries, training modules, and prototypes of digital waqf platforms. Regrettably, the utilization of research findings has not reached optimal levels due to insufficient integration between academic institutions and policy implementers.
3. Local Government; As articulated by Informant 7, the government’s role in facilitating regulatory frameworks and fostering collaboration among stakeholders is of paramount importance. Governments

possess the capacity to establish collaborative ecosystems and promote affirmative policies directed towards environmentally-oriented digital waqf initiatives.

4. Fintech and Digital Technology; Fintech entities (Informant 8) are capable of providing platforms based on smart contracts and blockchain technology; however, they necessitate collaboration with stakeholders from the waqf and regulatory sectors to effectively develop and validate digital green waqf systems.
5. General Public and Wakif; The general populace (Informants 4, 6, and 9) expresses a demand for transparency, participatory engagement, and sustainable information regarding digital waqf initiatives. They are predisposed to active involvement when provided with clear educational resources and opportunities for engagement from the outset.
6. Youth and Community; The youth demographic (Informant 5) exhibited considerable enthusiasm to engage in the promotion, digital education, and reinforcement of the green waqf narrative within social media platforms.
7. NGOs and Social Networks; Non-governmental organizations (Informant 10) can serve as crucial allies in the domains of independent monitoring, community engagement, and as communicative conduits between citizens and formal institutions.
8. Stakeholder Coordination Weaknesses; The interviews reveal a conspicuous absence of a definitive coordination forum among stakeholders, accompanied by an unclear distribution of roles. Certain actors have expressed feelings of exclusion from the comprehensive planning and execution processes.

The research outcomes indicate that the effective execution of the digital green waqf aimed at fostering social sustainability is influenced not solely by the advancement of technology, but significantly by robust and sustainable collaborations among multiple stakeholders. In accordance with the principles of collaborative governance theory, it is imperative that each stakeholder possesses a distinctly allocated and actively involved role throughout the phases of planning, execution, and evaluation. Within this framework, the synergy among the religious sector (waqf), the technological sector (fintech), and the social sector (comprising community, NGOs, and governmental entities) serves as the essential underpinning.

Conceptual Model Of Stakeholder Role

The following is presented a conceptual model of the role of stakeholders

Tabel 4
Conceptual Model Of Stakeholder Role

Stakeholders	Main Roles	Needs	Recommendations
Nadzir & Waqf Board	Asset and program management	Digital literacy, Waqf management system	Training, digitalization of Waqf accounting
Local Government	Facilitators and regulators	Map of actors, consolidation	The waqf digital coordination Forum
Islamic Fintech	Platform developer	Operational and legality partners	Sandbox for Waqf digital platform
Academician	Research & development provider	Policy and data access	Research-applied collaboration with nadzir
Community & Wakif	Participation & supervision	Education, transparency	Socialization and active engagement

NGO	Supervision & advocacy	Access to information & collaboration	Involvement in the monitoring process
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Green Waqf Digital Collaboration Strategy

To enhance collaborative synergies among stakeholders, scholars advocate for the following methodologies:

1. Establishment of a Digital Waqf Multi-Stakeholder Forum; This initiative is predicated upon the cooperative engagement of nadzir, governmental entities, the community, and the technological sector.
2. Digital Green Waqf Pentahelix Model; This model encompasses the integration of academic institutions, business enterprises, community organizations, governmental agencies, and media/technology components.
3. Roadmap for Stakeholder Implementation; This framework outlines the phases of socialization, training, asset digitization, and subsequent impact assessment.

The findings of this research significantly enrich the existing waqf literature by incorporating a multi-stakeholder and governance framework and offer valuable insights to policymakers and practitioners in the field to design inclusive digital green waqf governance structures.

The Impediments And Barriers Encountered In The Advancement Of Digital Green Waqf For The Promotion Of Social Sustainability In Riau

Solution Strategies for Mitigating Obstacles in the Advancement of Digital Green Waqf

Based on the findings derived from interviews and subsequent thematic analysis, the following strategies are posited as effective solutions to address impediments in the evolution of digital green waqf:

1. Enhancing Digital Literacy and Education on Digital Waqf
Implementing systematic training programs for nadhir, mosque administrators, and the general populace regarding digital technologies, with particular emphasis on the utilization of digital waqf platforms and the principles of green waqf. Develop educational modules that are both comprehensible and multimedia-oriented (including video tutorials, webinars, and infographics). Engage local communities and community leaders as facilitators of these training initiatives to ensure effective communication of the content.
2. Augmenting Digital Infrastructure in Remote Regions
Collaborating with local governmental bodies and telecommunications providers to extend internet coverage in underserved areas. Employ alternative technological solutions such as satellite internet or community networks to facilitate connectivity in challenging networking regions. Ensure public accessibility to digital devices at strategic locations, such as village halls or mosques.
3. Formulating Adaptive Regulations and Policies Pertaining to Digital Waqf
It is imperative for both provincial and central governments to expedite the formulation of specific regulations pertaining to the digitization of waqf and green waqf. Streamline licensing processes by establishing a specialized unit dedicated to the advancement of digital waqf, thereby enhancing both efficiency and transparency. Promote regulations that ensure data security and consumer protection within the framework of digital waqf.
4. Development of Integrated Systems and Promotion of Multi-Stakeholder Collaboration

Establish a cohesive digital waqf platform that interconnects waqf agencies, sharia fintech entities, and governmental bodies. Facilitate collaborative forums among nadhir, technology developers, and regulatory authorities to synchronize visions and address implementation challenges. Adopt open API technology to enable seamless communication and secure data sharing between various digital waqf platforms.

5. Fortifying Data Security and Transparency in Waqf Administration

Incorporate blockchain and smart contract technologies to guarantee transaction transparency and the effective management of waqf funds. Develop a publicly accessible dashboard that allows real-time monitoring of waqf fund utilization by the community. Conduct regular audits and reports involving community stakeholders and independent auditing agencies.

6. Enhancing Human Resource Capacity and Financial Support

Provide technical training for human resources responsible for managing the digital platform and information technology facets of waqf. Secure funding through corporate social responsibility initiatives, crowdfunding, and digital productive waqf frameworks to finance technological advancements. Establish internship programs and collaborative research initiatives with academic institutions to cultivate expertise.

7. Promoting Socialization and Enhancing Public Awareness

Implement a comprehensive campaign utilizing social media, local television, and community events to disseminate information regarding the advantages of green waqf and digital waqf. Involve local influencers and religious leaders to magnify the message and bolster community trust. Showcase success stories related to digital waqf as a source of inspiration for society.

Practical Implications of Proposed Solution Strategies

The execution of these strategies will: Augment community engagement in digital green waqf initiatives. Accelerate the creation of user-friendly and reliable waqf technologies. Establish an inclusive, transparent, and sustainable waqf ecosystem. Reinforce the roles of governmental and waqf institutions in fostering social sustainability through digital innovation.

Expectations And Recommendations Of Stakeholders Towards The Development Of Digital Green Waqf To Support Social Sustainability In Riau

Stakeholders possess elevated expectations that the digital green waqf can: Facilitate access to waqf and ensure transparent governance. Evolve into a secure platform that assures the confidence of wakifs. Promote synergies among diverse relevant entities for expedited development. Be perpetually advanced through innovative means grounded in Sharia principles. Bolster social and environmental initiatives that yield tangible impact. Crucial emerging recommendations highlight the significance of ongoing education and training, the enhancement of regulatory frameworks, transparency in management practices, and the proactive engagement of the public in oversight.

Table 6
Overall synthesis of findings from 10 informants

Aspects	Main Findings
Understanding the Digital Green Waqf	The majority of informants understand the concept of digital Waqf and green waqf in general, but there are variations in the depth of knowledge.

Challenges and obstacles	The main barriers are related to digital literacy, infrastructure, regulation, and limited human resources.
Benefits and potential	Digital green waqf is seen as having the potential to increase transparency, efficiency and reach of Waqf, especially for the younger generation.
Development Strategy	The need for continuing education, infrastructure strengthening, multi-stakeholder collaboration, and adaptive regulation.
Expectations and recommendations	The hope is that the digital green waqf can be inclusive, safe, transparent, and socio-environmentally supportive, with recommendations focusing on education, auditing, collaboration, and technological innovation.

The majority of informants conceptualize the digital green waqf as a technological advancement that enables the effective execution of waqf initiatives while underscoring the significance of environmental sustainability. Nonetheless, the level of comprehension is heterogeneous, particularly among rural populations and marginalized groups.

Numerous impediments were identified, including inadequate digital literacy, restricted internet connectivity in isolated regions, ambiguous regulatory frameworks, and a deficit of skilled human resources. The digital green waqf possesses substantial potential to enhance community engagement, particularly among the youth, promote transparency in financial management, and bolster socio-environmental initiatives.

Proposed strategies for advancement encompass educational and training programs, enhancements to infrastructure, the cultivation of multi-stakeholder collaborations, the fortification of regulatory measures, and the utilization of emerging technologies such as blockchain.

Informants express the aspiration that the evolution of the digital green waqf can be characterized by inclusivity and transparency, while promoting community participation. Recommendations emphasize the necessity for education, transparent auditing practices, cross-sector partnerships, and technological advancements grounded in sharia principles.

CONCLUSION

The advancement of digital green waqf initiatives in Riau continues to encounter numerous obstacles; however, it concurrently presents significant prospects for enhancing social and environmental sustainability. There exists an imperative to elevate the level of community comprehension through systematic education and training programs, while the provision of regulatory frameworks and infrastructural support emerges as a fundamental determinant of success.

It is essential for governmental bodies and waqf organizations to engage in collaborative efforts to formulate regulations that facilitate the digitization of waqf. The intensification of digital literacy training and educational programs is particularly crucial in remote regions. The trajectory of technological development should prioritize accessibility, security, and transparency. Synergistic partnerships among governmental entities, fintech organizations, waqf institutions, and the broader society must be fortified. Moreover, digital waqf initiatives should be intricately aligned with genuine environmental preservation agendas to bolster the objectives of green waqf.

The present study relied on interviews with a limited cohort of 10 informants, which constrains the generalizability of the findings. It is advisable to undertake quantitative or mixed-methods research with larger participant samples to enhance the robustness and validity of the outcomes. In light of the findings and comprehensive analysis presented in this study, the following strategic policy recommendations are proposed: First, Drafting Specific Regulations Related to Digital Waqf and Green Waqf; Local governmental authorities and national waqf bodies are urged to develop specific regulations that delineate the operational frameworks governing digital waqf and green waqf, encompassing the legal implications of employing technologies such as blockchain, smart contracts, and tokenization in the administration of waqf assets. Second, Improving Digital Literacy of Waqf for Society and Nadzir; It is recommended that training and educational initiatives centered on the principles of digital waqf and green waqf be instituted, particularly targeting waqf administrators (nadzir), wakif communities, and the technologically adept younger generations. Third, Development and Strengthening of Waqf Technology Infrastructure; Governmental bodies and partners within Sharia financial institutions are called upon to advocate for the establishment of secure, transparent, and user-friendly digital waqf platforms, ensuring their accessibility to the public, including individuals residing in rural locales. Fourth, Incentives and Strategic Partnerships; The formulation of fiscal or non-fiscal incentive policies for institutions engaged in the development of digital-based green waqf programs is imperative. Additionally, partnerships among governmental entities, zakat-waqf institutions, sharia fintech startups, and academic institutions should be actively promoted. Fifth, Technology-Based Transparent Monitoring and Auditing; To sustain public trust in waqf operations, it is crucial to deploy a technology-driven monitoring and auditing system on a regular basis, thereby allowing for real-time public access to reports and the utilization of waqf funds.

Further Research Recommendations are as follows ; First, Quantitative Testing of Green Waqf Digital Models; Future research endeavors are recommended to adopt a quantitative methodology aimed at assessing the influence of waqf digitization on community engagement and its ramifications for social sustainability indicators. Second, Comparative Studies Between Regions or Countries; Conducting comparative studies across different regions of Indonesia, or between Indonesia and other nations such as Malaysia or Turkey, may yield valuable insights into exemplary practices in the implementation of digital green waqf. Third, Exploring DeFi and DAO Integration in Waqf; Subsequent research could delve deeper into the technical aspects of integrating Decentralized Finance (DeFi) and Decentralized Autonomous Organizations (DAO) into waqf governance, with the intent of enhancing public participation and operational efficiency. Fourth, Nadzir Readiness Analysis Adopts Digital Waqf Technology; In-depth investigations focusing on the readiness of nadzir institutions, encompassing human resources, technological infrastructure, and managerial capabilities in the context of digital transformation within waqf, are warranted. Fifth, Environmental Impact Assessment of Green Waqf; Further research should broaden its scope to examine the tangible effects of green waqf on environmental outcomes, including reductions in carbon footprints, land conservation efforts, and the empowerment of communities engaged in waqf-based green initiatives.

REFERENCES

- Abdullah, M. (2018). Waqf, sustainable development goals (Sdgs) and maqasid al-shariah. *International Journal of Social Economics*, 45(1), 158–172. <https://doi.org/10.1108/IJSE-10-2016-0295>

- Abdullah, Z., & Susanto, A. A. (2019). The role of investment-based islamic crowdfunding for halal msme: Evidence from indonesia. *Al-Iqtishad: Jurnal Ilmu Ekonomi Syariah*, 11(2). <https://doi.org/10.15408/aiq.v11i2.13623>
- Ajmal, M. M., Khan, M., Hussain, M., & Helo, P. (2018). Conceptualizing and incorporating social sustainability in the business world. *International Journal of Sustainable Development & World Ecology*, 25(4), 327–339. <https://doi.org/10.1080/13504509.2017.1408714>
- Alfarisi, M. S., & Huda, N. (2023). Integrasi green waqf melalui platform digital crowdfunding dan dampak sosialnya bagi masyarakat. *JES (Jurnal Ekonomi Syariah)*, 8(2), 152–165. <https://doi.org/10.30736/jes.v8i2.623>
- Ascarya, A., Hosen, M.N. and Rahmawati, S. (2022), "Designing simple productive waqf models for Indonesia", *International Journal of Ethics and Systems*, Vol. 38 No. 3, pp. 380-401. <https://doi.org/10.1108/IJOES-07-2020-0101>
- Auna Nida Ulhusna, N. S., Azizah, N., Putri Dinanti, S., & Adriansyah, Z. (2024). Peran wakaf digital dalam mencapai tujuan pembangunan berkelanjutan(SDG's). *OIKONOMIKA : Jurnal Kajian Ekonomi dan Keuangan Syariah*, 5(1), 52–63. <https://doi.org/10.53491/oikonomika.v5i1.1128>
- Eugenia, S. (2023). Strategi pengembangan gerakan green waqf di indonesia. <http://repository.ipb.ac.id/handle/123456789/120890>
- Faruk, F. M. (2020). Regional Social Sustainability Index in Indonesia 2017. *Jurnal Perencanaan Pembangunan: The Indonesian Journal of Development Planning*, 4(1), 40–53. <https://doi.org/10.36574/jpp.v4i1.103>
- Firmansyah, M. T., Suherman, A., & Mayza, T. M. (2023). Tingkat partisipasi masyarakat dalam mengoptimalkan bank sampah di kelurahan sindangsari kabupaten tangerang. *Innovative: Journal Of Social Science Research*, 3(5), 7483–7497. <https://j-innovative.org/index.php/Innovative/article/view/5690>
- Hasan, N. F., & Syahrudin, S. (2022). Enhancing green waqf for carbonization technology: Opportunities for sustainable development goals (Sdgs) in indonesia. *El Barka: Journal of Islamic Economics and Business*, 5(2), 235–251. <https://doi.org/10.21154/elbarka.v5i2.4739>
- Hatimah, H., Sukoharsono, E. G., Djamhuri, A., & Adib, N. (2023). Green economy and green waqf opportunities of digital assets. Dalam Y. A. Yusran, F. G. M. Fitri, T. A. Wihastuti, F. A. Nugroho, & I. D. Qurbani (Ed.), *Proceedings of the 2022 Brawijaya International Conference (BIC 2022)* (Vol. 235, hlm. 19–25). Atlantis Press International BV. https://doi.org/10.2991/978-94-6463-140-1_3
- Hatimah, H., Sukoharsono, E. G., Djamhuri, A., & Adib, N. (2023). Green economy and green waqf opportunities of digital assets. Dalam Y. A. Yusran, F. G. M. Fitri, T. A. Wihastuti, F. A. Nugroho, & I. D. Qurbani (Ed.), *Proceedings of the 2022 Brawijaya International Conference (BIC 2022)* (Vol. 235, hlm. 19–25). Atlantis Press International BV. https://doi.org/10.2991/978-94-6463-140-1_3
- Irfany, M. I., Ningsih, S. R. ., Hasanah, Q. ., & Rusydiana, A. S. (2023). Proposing Green Waqf Development Strategy in Protecting Land Ecosystems in Indonesia: An Interpretive Structural Modeling Approach. *Ekonomi Islam Indonesia*, 5(1). <https://doi.org/10.58968/eii.v5i1.201>
- Jannah, M., Ali, K. M., Fatria, B. L., Sarkawi, A. A., & Othman, J. (2021). Enhancing waqf forest sustainability through agroforestry: Case study from bogor waqf forest, bogor, indonesia. *Islam Realitas: Journal of Islamic and Social Studies*, 7(1), 57. https://doi.org/10.30983/islam_realitas.v7i1.4454

- Laluddin, H., Haneef, S. S. S., Haji Mohammad, M. T. S., & Rahman, M. P. (2021). Revisiting the concept of waqf: Its maintenance, issues and challenges. *International Journal of Islamic Thought*, 20. <https://doi.org/10.24035/ijit.20.2021.210>
- Maisyarah, A., & Hadi, K. (2024). Implementasi model pengelolaan wakaf berbasis digital dalam meningkatkan tujuan pembangunan berkelanjutan(Sdg's). *Jurnal Ilmiah Ekonomi Islam*, 10(1), 887. <https://doi.org/10.29040/jiei.v10i1.12079>
- Ningsih, S. R. (2022). Strategi pengembangan green waqf dalam menjaga ekosistem darat di indonesia: Pendekatan interpretive structural modeling. <http://repository.ipb.ac.id/handle/123456789/115151>
- Ningsih, S. R., Irfany, M. I., Rusydiana, A. S., & Hasanah, Q. (2022). Strategi pengembangan green waqf dalam mendukung sdg 15 di indonesia. *Policy Brief Pertanian, Kelautan, Dan Biosains Tropika*, 4(4), 420–426. <https://doi.org/10.29244/agro-maritim.0404.420-426>
- Rusydiana, A. S., & Bahri, M. S. (2021). Green Economy and Some Relevancies from Islamic Finance Perspective. *Jurnal Ekonomi Syariah Teori dan Terapan*, 3(1), 1-10. <https://download.garuda.kemdikbud.go.id/article.php?article=3004645&title=Green+Economy+and+Some+Relevancies+from+Islamic+Finance+Perspective&val=27165>
- Sukaina, I., Zahidah, H., & Arifian, F. (2022). Inovasi Aplikasi Online Green Waqf Berbasis Blockchain Guna Pendanaan Produktivitas Tamanu Sebagai Upaya Pelestarian Lingkungan. *JIOSE: Journal of Indonesian Sharia Economics*, 1(2), 139-156. <https://doi.org/https://doi.org/10.35878/jiose.v1i2.484>
- Takwin, A. (2024). Penggabungan waqf hijau melalui sistem pendanaan bersama digital dan implikasinya pada aspek sosial dan masyarakat. *SHACRAL: Shari'ah Economics Review Journal*, 1(1), 1–11. <https://doi.org/10.62952/shacral.v1i1.10>
- Tjahjadi, B., Soewarno, N., Karima, T. E., & Sutarsa, A. A. P. (2024). Socially friendly business strategy and social sustainability performance: Roles of spiritual capital and social management process. *Social Responsibility Journal*, 20(4), 804–824. <https://doi.org/10.1108/SRJ-11-2022-0496>
- Vidiati, C., Hendra, E., Santoso, S., & Faturrizky, I. (2021). What Blockchain Technology Can Do to Contribute to Waqf, 4(1), 53-71. <https://download.garuda.kemdikbud.go.id/article.php?article=2789231&title=What+Blockchain+Technology+Can+Do+to+Contribute+to+Waqf&val=11590>