

Green Sukuk, Waqf, and Sustainable Development: Advancing Islamic Financial Instruments for the Ecological Transition

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ABSTRACT

Climate change, environmental degradation, and the demand for financing to advance the SDGs have renewed interest in ethical, socially inclusive approaches to ecological transition. Although green finance has expanded, it remains unclear whether it can integrate sustainability with social inclusion, ethical accountability, and community resilience. This study examines integrating Green Sukuk and Waqf as complementary Islamic financial instruments for sustainable development. It analyses their characteristics, assesses synergies between market-based and endowment-based financing, and develops an integrated framework. Using a qualitative analytical approach, it draws on classical Islamic sources, contemporary literature, policy reports, and selected initiatives. Green Sukuk can mobilise capital for renewable energy, infrastructure, and climate adaptation, while Waqf can provide enduring support for conservation, ecological education, and community development. Their integration combines Sukuk's capital-mobilisation capacity with Waqf's perpetual, social orientation, creating a more diversified financing structure. Institutional coordination, regulatory harmonisation, governance, Shariah compliance, transparency, and risk management are critical conditions. The Green Sukuk-Waqf framework provides a basis for climate finance aligned with Islamic principles.

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INTRODUCTION

Climate change, environmental degradation, biodiversity loss, resource depletion, and the increasing frequency of climate-related disasters have transformed environmental sustainability from a peripheral policy concern into a central development and financing imperative. The challenge is particularly acute in developing and emerging economies, where climate vulnerabilities are often greatest while fiscal space, domestic capital markets, and access to affordable long-term finance remain constrained. Recent evidence illustrates the scale of this financing problem. The United Nations Environment Programme (UNEP) estimates that developing

countries face an annual adaptation-finance gap of approximately US\$187–359 billion, while international public adaptation finance remains far below the level required to address escalating climate risks (UNEP, 2024; Abdallah et al. 2026). More recent evidence indicates that the gap remains substantial, with adaptation finance needs in developing countries estimated at US\$310 billion annually by 2035 based on modelled costs and as much as US\$365 billion when expressed through national climate plans (Bello et al. 2026, Muhammad et al. 2025). These figures demonstrate that achieving the Sustainable Development Goals (SDGs), particularly SDGs 6, 7, 11, 12, 13 and 15, requires not merely additional financial resources but also innovative financing architectures capable of mobilising private, public, social, and community-based capital.

The financing challenge is especially significant because conventional debt-oriented mechanisms may place additional fiscal pressure on developing economies already confronting high debt-service obligations. The World Bank (2024), for example, reports that in almost 60% of banks in emerging market and developing economies, climate-related lending represents less than 5% of total portfolios, while more than one-quarter of banks provide no climate financing at all. The problem therefore extends beyond the absolute availability of capital to questions of institutional design, risk allocation, project bankability, social inclusion, and the ability to channel capital toward long-term environmental and community outcomes. Consequently, there is increasing interest in sustainable finance instruments that can mobilise large-scale investment while simultaneously incorporating environmental, social, ethical, and developmental objectives.

Within this emerging landscape, Islamic finance offers a potentially important but still underdeveloped avenue for sustainable development financing. Its principles of asset-backing, prohibition of *riba* and excessive *gharar*, risk-sharing, linkage between finance and the real economy, ethical investment, and concern for social welfare provide a normative foundation that can complement contemporary sustainability objectives. The World Bank characterises Islamic finance as asset-backed, ethical, socially and environmentally responsible, and oriented toward risk-sharing, real economic activity, financial inclusion, and social welfare. These characteristics create an important conceptual intersection between Islamic finance and the contemporary sustainable-finance agenda. The convergence is particularly visible in the development of Green Sukuk, which combines the Shariah-compliant structure of Sukuk with the use-of-proceeds and environmental objectives associated with green finance.

Green Sukuk can therefore be understood as a Shariah-compliant capital-market instrument through which funds are mobilised for environmentally beneficial projects, including renewable energy, energy efficiency, sustainable transport, waste management, climate-resilient infrastructure, and other eligible green investments. The World Bank identifies Green Sukuk as an instrument capable of connecting Islamic capital markets with green infrastructure while attracting both Islamic and socially responsible investors. More importantly, recent developments demonstrate that Green Sukuk is no longer merely a theoretical proposition. The Islamic Development Bank (IsDB), for example, has established a Sustainable Finance Framework through which Green and Sustainability Sukuk are used to mobilise international capital for green, social, and resilience-oriented development projects. By 2024, the IsDB had issued more than US\$5 billion in Green and Sustainability Sukuk under this framework (IsDB, 2024).

The institutionalisation of sustainable Sukuk has also advanced through international standard-setting. In 2024, the International Capital Market Association (ICMA), the IsDB, and the London Stock Exchange Group (LSEG) jointly published guidance on Green, Social and Sustainability Sukuk, providing practical guidance for issuers on aligning Sukuk with internationally recognised sustainable-finance principles. The guidance reported that the

sustainable Sukuk market had exceeded US\$47 billion in cumulative issuance since 2017, with US\$13.4 billion issued in 2023 alone. Nevertheless, the Islamic Financial Services Board (IFSB) reported that although total sustainable Sukuk issuance increased to US\$15.3 billion in 2024, Green Sukuk issuance itself declined from US\$7.75 billion in 2023 to US\$4.81 billion in 2024. The IFSB attributes this partly to structural constraints, including a limited pipeline of eligible green projects, while noting that sustainable Sukuk still represents a relatively small proportion of the overall Sukuk market (IFSB, 2025; Danladi et al. 2026). This evidence suggests that the expansion of Green Sukuk cannot depend exclusively on conventional capital-market development; complementary institutional mechanisms may be necessary to generate investable projects, strengthen community participation, improve project sustainability, and broaden the social base of climate finance.

The literature on Green Sukuk has grown rapidly in response to these developments. Recent reviews demonstrate that scholarly interest has expanded from conceptual discussions of Shariah compliance toward issues including market development, sustainability, investor behaviour, risk, pricing, policy, ESG integration, and SDG financing. Alkadi (2024), in a systematic review of 62 peer-reviewed studies, argues that Green Sukuk scholarship has become increasingly important but remains fragmented across multiple themes and research streams. Similarly, Ulfah et al. (2024), through a structured review of Scopus-indexed literature, identify the dominance of theoretical and qualitative approaches and observe that empirical research remains comparatively limited. Their findings also indicate that existing studies concentrate heavily on the relationship between Green Sukuk, environmental issues, climate change, green reporting, and the SDGs.

The broader sustainable-finance literature reinforces the relevance of Green Sukuk while also revealing important limitations. Muhmad et al. (2024), for instance, demonstrate through a systematic literature review and bibliometric analysis that green finance has become increasingly connected with renewable-energy development and environmental innovation. However, this literature largely examines green finance through conventional financial-market and policy frameworks. The Islamic dimension, including the potential contribution of Islamic social-finance institutions, remains comparatively less integrated into mainstream sustainable-finance scholarship. Similarly, the literature on Islamic sustainable finance increasingly recognises that Islamic financial instruments can contribute to SDG achievement, but significant conceptual and institutional questions remain concerning how commercial Islamic finance can be connected systematically with social-finance mechanisms.

This issue becomes particularly important when Waqf is considered. Historically, Waqf has functioned as an institution for the perpetual provision of social, educational, health, religious, and public goods. Its defining characteristic is not simply charitable transfer but the preservation and productive use of an endowed asset for continuing benefit. This perpetual orientation makes Waqf conceptually relevant to sustainability because environmental protection and ecological restoration frequently require long-term financing rather than short-term project expenditure. Productive and cash Waqf can potentially provide patient capital for projects whose social and environmental benefits extend across generations. Recent research on Waqf sustainability confirms increasing scholarly interest in institutional effectiveness, accountability, management, financial sustainability, and performance measurement, although environmental sustainability has historically received less systematic attention than socioeconomic welfare (2024).

The emerging literature on Green Waqf represents an important development in this respect. Recent studies argue that Waqf can be directed toward environmental conservation, renewable energy, sustainable agriculture, ecological restoration, green infrastructure, environmental education, and community-based climate initiatives. Research on Waqf-based

renewable-energy financing has already demonstrated the theoretical potential of restructuring Waqf institutions to pool capital for environmentally beneficial investments. More recent scholarship further conceptualises Green Waqf as an instrument capable of connecting Islamic philanthropy with environmental sustainability and the SDGs. Thus, an important conceptual transition is taking place: Waqf is increasingly being understood not merely as a mechanism for poverty alleviation and traditional charitable provision but also as a potential source of long-term capital for environmental and community resilience.

Despite these developments, the Green Waqf literature remains comparatively nascent and fragmented. Much of the existing scholarship focuses on defining Green Waqf, identifying its potential environmental applications, discussing *maqāṣid al-Sharīʿah*, or proposing individual financing models. Recent studies have identified challenges involving governance, the capacity of *nāẓirs*, financial literacy, institutional fragmentation, accountability, and limited integration with contemporary financial markets. Other research has begun to explore Green Waqf crowdfunding and Waqf-based environmental projects, but these studies remain largely conceptual or geographically specific. Consequently, the literature has not yet adequately established how Waqf can be structurally connected to a large-scale capital-market instrument such as Green Sukuk in a manner that simultaneously preserves the distinctive functions of both institutions.

This represents a significant conceptual problem. Green Sukuk and Waqf possess complementary rather than identical financial characteristics. Green Sukuk is fundamentally a capital-market mobilisation mechanism capable of attracting institutional and private investors and raising substantial volumes of project finance. Waqf, by contrast, is an Islamic social-finance institution characterised by perpetuity, public benefit, and the preservation and productive utilisation of endowed assets. Treating the two instruments as substitutes would therefore overlook their distinctive institutional functions. A more promising approach is to investigate whether they can operate as complementary components within an integrated financing architecture: Green Sukuk could mobilise large-scale investment capital for eligible environmental infrastructure, while Waqf could provide perpetual or catalytic capital, community assets, concessional support, land, project-development resources, social infrastructure, or long-term maintenance mechanisms. Such complementarity could potentially address one of the central weaknesses of climate finance: the fragmentation between large-scale investment capital and locally embedded, socially oriented financing.

The need for such integration is reinforced by developments in financial regulation. Indonesia provides an especially instructive example because its regulatory framework has explicitly expanded the scope of sustainability-related securities and Sukuk. OJK Regulation No. 18/2023, effective from 2024, covers Green Sukuk, social Sukuk, sustainability Sukuk, sustainability-linked instruments, and Sukuk Waqf. This regulatory development demonstrates that the institutional boundaries between Islamic capital-market instruments and Waqf are not necessarily fixed. Rather, contemporary regulatory innovation is beginning to recognise possibilities for connecting market-based sustainable finance with Islamic social-finance institutions.

Nevertheless, regulatory recognition does not automatically produce an effective integrated financing mechanism. Several unresolved questions remain. First, there is insufficient clarity regarding the appropriate institutional architecture for combining Green Sukuk with Waqf without compromising the Shariah requirements, fiduciary responsibilities, and financial integrity of either instrument. Second, the existing literature provides limited analysis of how Waqf can contribute to the project lifecycle of Green Sukuk, including project identification, land provision, risk mitigation,

community participation, maintenance, and long-term impact generation. Third, sustainability reporting and impact measurement remain important challenges because the environmental claims attached to financial instruments must be supported by credible allocation, monitoring, verification, and reporting mechanisms. The growing emphasis on internationally aligned sustainable Sukuk standards makes these questions increasingly consequential. ICMA's 2025 guidance, for example, continues to emphasise clear eligibility, allocation, reporting, and impact considerations for sustainable financial instruments.

A further gap concerns the social dimension of ecological transition. Much of the Green Sukuk literature evaluates environmental outcomes and financial-market performance, whereas much of the Waqf literature concentrates on social welfare and institutional sustainability. The intersection between these two dimensions remains inadequately theorised. Climate change, however, is simultaneously an environmental, economic, and social-justice problem. Poor and vulnerable communities are disproportionately exposed to climate-related risks, while many adaptation investments generate public-good benefits that cannot be fully captured through conventional commercial-return calculations. UNEP (2024) therefore emphasises that adaptation financing must become more anticipatory, strategic, transformational, and attentive to fairness and equity. A financing framework that combines the scale and investment capacity of Green Sukuk with the social orientation and perpetuity of Waqf could potentially address this tension by linking financial mobilisation with intergenerational welfare and community resilience.

The critical gap in the existing literature, therefore, is not the absence of research on Green Sukuk or the absence of research on Waqf individually. Rather, it is the limited conceptual and institutional integration of these two complementary Islamic financial mechanisms into a coherent framework for ecological transition and sustainable development. Existing Green Sukuk studies primarily examine the instrument itself, its market development, Shariah characteristics, environmental applications, investor considerations, or policy implications. Existing Waqf studies increasingly investigate productive Waqf, Green Waqf, environmental conservation, and sustainable development, but rarely explain how Waqf can be systematically connected to capital-market instruments capable of mobilising large-scale climate finance. The literature therefore lacks a sufficiently developed framework explaining how commercial Islamic finance and Islamic social finance can operate together across the financing lifecycle of environmentally sustainable projects.

The present study responds to this gap by examining the complementary potential of Green Sukuk and Waqf as Islamic financial instruments for ecological transition. Consistent with the conceptual orientation of the study's abstract, the research treats Green Sukuk as a mechanism for mobilising substantial capital toward renewable energy, sustainable infrastructure, climate adaptation, and environmentally friendly investments, while positioning Waqf as a mechanism for generating enduring financial, social, educational, conservation, and community-oriented benefits. Rather than conceptualising the instruments independently, the study investigates how their respective strengths can be combined into a hybrid financing framework capable of linking capital-market efficiency with social purpose, environmental stewardship, and long-term community resilience.

Accordingly, the study aims to examine the conceptual, structural, and Shariah foundations of Green Sukuk and Waqf as instruments for sustainable development and ecological transition, while critically reviewing existing literature and contemporary practices on their application to climate finance, environmental sustainability, and the SDGs. It further seeks to identify the institutional, financial, regulatory, governance, and operational challenges affecting their integration and, ultimately, to propose an integrated Green Sukuk–

Waqf financing framework that combines large-scale capital mobilisation with perpetual social-finance mechanisms to support environmental protection, climate resilience, renewable energy, sustainable infrastructure, and inclusive sustainable development.

The study consequently contributes to the emerging literature on Islamic sustainable finance by moving the discussion beyond the separate consideration of market-based and philanthropic instruments toward an integrated architecture of Islamic climate finance. Its central proposition is that the ecological transition requires financial mechanisms capable not only of mobilising capital but also of preserving social purpose, intergenerational responsibility, community participation, and environmental integrity. Green Sukuk and Waqf, when appropriately structured and governed, may offer complementary responses to these requirements. Such integration could expand the financing base for climate action, reduce exclusive dependence on conventional debt-oriented financing, strengthen community participation in environmental projects, and reinforce the alignment between Islamic financial ethics and the global sustainable-development agenda.

METHOD

This study adopts a qualitative and analytical research approach to critically examine the potential integration of Green Sukuk and Waqf as complementary Islamic financing instruments for ecological transition and sustainable development. The qualitative approach is appropriate because the study seeks to interpret the normative, institutional, financial, and sustainability dimensions of these instruments rather than measure relationships through quantitative techniques. The analytical component is used to critically compare their structural foundations, financing functions, sustainability contributions, and institutional limitations and subsequently synthesize these insights into an integrated conceptual framework. Similar qualitative approaches have been employed in recent research examining Green Sukuk, Islamic sustainable finance, and the relationship between Islamic financial instruments and the SDGs.

2.1 Sources of Data

The analysis relies exclusively on secondary sources, consistent with the study's conceptual orientation. Four principal categories of sources are examined. First, classical Islamic sources, including the Qur'an, authentic Sunnah, and relevant classical jurisprudential and Islamic economic writings, are used to establish the normative foundations of Waqf, environmental stewardship, social responsibility, justice, and responsible economic activity. Second, contemporary peer-reviewed literature on Islamic finance, Green Sukuk, Waqf, Islamic social finance, climate finance, and sustainable development is examined to identify current scholarly arguments and debates. Third, policy and institutional documents issued by relevant international and national institutions are considered to understand regulatory, operational, and sustainability requirements. Fourth, existing Green Sukuk and Waqf initiatives are reviewed as practical illustrations of how these instruments have been applied in contemporary Islamic finance.

2.2 Analytical Procedure

The collected materials are examined through qualitative thematic and comparative analysis. The analysis proceeds through four interconnected stages. First, the conceptual and Shariah foundations of Green Sukuk and Waqf are identified. Second, their respective financing functions and contributions to environmental and sustainable-development objectives are examined. Third, the literature and existing initiatives are critically compared to identify areas of complementarity, as well as institutional, regulatory, governance, and operational challenges. Fourth, the resulting

themes are synthesised to develop an integrated Green Sukuk–Waqf financing framework for ecological transition.

Particular attention is given to the complementary characteristics of the two instruments. Green Sukuk is examined primarily in terms of its capacity to mobilise large-scale investment capital for eligible environmental projects, whereas Waqf is analysed in terms of its perpetual, socially oriented, and community-based financing potential. The analysis therefore moves beyond examining the instruments independently and considers how their respective strengths could be combined within a coherent sustainable-finance architecture.

2.3 Conceptual Synthesis

The final stage involves conceptual synthesis, through which findings from Islamic sources, contemporary scholarship, policy documents, and existing initiatives are integrated into a proposed hybrid financing framework. The framework is assessed according to four principal considerations: Shariah compatibility, financial complementarity, environmental sustainability, and social-development impact. This enables the study to establish how Green Sukuk and Waqf can potentially operate together while maintaining their distinctive institutional functions.

The methodology is therefore designed not to claim empirical verification of the proposed model but to provide a theoretically and analytically grounded framework that can subsequently be subjected to empirical testing in specific national or institutional contexts. This distinction is important because recent Green Sukuk research has also demonstrated the value of qualitative analysis for examining normative, institutional, and sustainability dimensions that cannot be adequately captured through financial indicators alone.

RESULTS AND DISCUSSION

Conceptual and Shariah Foundations of Green Sukuk and Waqf

The analysis demonstrates that Green Sukuk and Waqf possess distinct but potentially complementary foundations within the broader Islamic economic and financial system. Green Sukuk represents the capital-market dimension of Islamic sustainable finance, while Waqf represents its enduring social-finance and community-development dimension. Their convergence is therefore not based on treating the two instruments as identical financing mechanisms, but on recognising that they can address different stages and dimensions of sustainable development financing.

Green Sukuk derives its legitimacy from the broader Shariah principles governing Sukuk, including asset linkage, lawful underlying activities, avoidance of *riba*, *gharar*, and *maysir*, and connection between financial transactions and productive economic activity. Its environmental orientation adds an explicit sustainability dimension by restricting the use of proceeds to eligible green projects. Consequently, Green Sukuk can connect Islamic capital-market mobilisation with environmental objectives such as renewable energy, clean transportation, sustainable infrastructure, energy efficiency, waste management, and climate adaptation (Sukmana, 2020; Yusuf et al. 2026). Recent international developments confirm the increasing institutionalisation of this approach. The UNDP's 2025 analysis identifies Green Sukuk as a potentially important mechanism for mobilising capital toward climate resilience, sustainable economic development, and social equity.

Waqf, in contrast, is fundamentally based on the dedication of an asset for a continuing lawful benefit. Its distinctive characteristic is perpetuity: the endowed asset or its productive value is preserved while its benefits are directed toward specified beneficiaries or public purposes. This characteristic gives Waqf an important intergenerational dimension. Whereas a conventional

financing instrument generally seeks repayment and financial return within a predetermined contractual period, Waqf can support benefits that continue beyond the original financing horizon.

The analysis therefore identifies a fundamental conceptual complementarity. Green Sukuk provides scale, investment discipline, and access to capital markets; Waqf provides permanence, social purpose, community participation, and long-term benefit. This distinction is important because ecological transition requires both large-scale capital expenditure and long-term institutional commitment. Renewable-energy facilities, sustainable water systems, ecological restoration, green public infrastructure, and climate-resilient community facilities may require substantial initial investment but also continuing maintenance and community stewardship. Green Sukuk can potentially address the first requirement, while Waqf can contribute to the second.

This finding is consistent with emerging literature that increasingly conceptualises Green Waqf as a mechanism for supporting renewable energy, afforestation, biodiversity protection, sustainable urban development, and other environmental objectives. Recent research specifically identifies Green Waqf as a potential instrument for linking environmental stewardship with community empowerment and the SDGs.

Complementary Financing Functions of Green Sukuk and Waqf

The analysis further indicates that the greatest potential of the two instruments lies not in their independent application but in their functional complementarity.

Green Sukuk can mobilise relatively large volumes of capital from institutional, sovereign, corporate, and retail investors. Its capital-market structure makes it particularly appropriate for financing projects with identifiable assets, predictable cash flows, defined investment horizons, and measurable environmental outcomes. Existing international experience demonstrates that Green Sukuk has already moved beyond conceptual experimentation (Shah et al. 2024; Muhammad et al. 2026). The Islamic Development Bank, for example, has continued to use Green Sukuk to mobilise international capital for sustainable development and climate-related investments, including a EUR500 million Green Sukuk issued in October 2025.

Waqf provides a different type of capital. Its strength lies in its ability to mobilise philanthropic and socially motivated resources and convert them into enduring assets or productive investments. Rather than competing with Green Sukuk for the same financing function, Waqf can operate as a catalytic, complementary, or perpetual layer within a broader financing structure.

The complementarity between Green Sukuk and Waqf can be conceptualised across the project lifecycle, with each instrument addressing different but potentially interconnected financing requirements. Green Sukuk can provide scalable, market-based capital for the development and financing of environmentally sustainable projects, whereas Waqf can provide enduring social and community-oriented support for beneficiaries, environmental assets, maintenance, and related services. Their integration therefore offers a potential financing architecture that combines the capital-mobilisation capacity of Sukuk with the perpetual and socially embedded character of Waqf.

Table 1. Complementarity of Green Sukuk and Waqf Across the Project Lifecycle

Financing Function	Green Sukuk	Waqf
Capital mobilisation	Mobilises large-scale capital from institutional and retail investors through Shariah-compliant market-based financing.	Mobilises social, philanthropic, and community-based capital through endowment contributions and donations.
Investment horizon	Operates within a defined contractual tenor determined by	Potentially perpetual, particularly where endowed assets are preserved

	the Sukuk structure and underlying project.	and their returns are continuously reinvested or distributed.
Primary orientation	Primarily oriented towards investment and project financing, particularly eligible green and environmentally sustainable projects.	Primarily oriented towards long-term public, social, and community benefit.
Investor/contributor base	Institutional investors, financial institutions, sovereign entities, and retail investors.	Donors, philanthropists, charitable organisations, communities, and other social-finance contributors.
Environmental role	Provides financing for renewable energy, sustainable infrastructure, climate adaptation, and other eligible green projects.	Supports enduring environmental and community assets, including conservation, ecological education, water infrastructure, and climate-resilient social services.
Community participation	Generally indirect, although community participation can be incorporated through project design and stakeholder engagement.	Potentially direct through community ownership, participation, service provision, and beneficiary involvement.
Long-term maintenance	Dependent on the underlying project structure, contractual arrangements, and availability of subsequent financing.	Potentially supported through productive Waqf, whereby endowed assets generate continuing income for maintenance and environmental purposes.
Social inclusion	Can incorporate social objectives through project selection, impact criteria, and inclusive financing design.	Intrinsic to many Waqf purposes, particularly those addressing poverty, education, healthcare, livelihoods, and community welfare.
Complementary function	Provides scalable, structured, and market-based capital for environmentally sustainable projects.	Provides enduring, socially oriented financing that can support beneficiaries, environmental assets, and long-term project sustainability.
Potential integration	Can provide upfront or large-scale capital for eligible ecological projects, with defined financial and contractual arrangements.	Can complement Sukuk financing through perpetual or long-term funding for social components, maintenance, community services, and post-project sustainability.

Source: Authors' conceptualisation based on the reviewed literature and Islamic finance principles.

This complementarity is particularly relevant because one of the continuing challenges facing Green Sukuk is the availability of sufficiently bankable green projects. The World Bank's current Islamic climate-finance agenda explicitly highlights the importance of preparing bankable projects and scaling Islamic social-finance tools such as Waqf to support community resilience and measurable climate outcomes.

The finding suggests that Waqf can potentially contribute to project development before and beyond the Green Sukuk issuance itself. For example, Waqf land may provide a location for renewable-energy or community infrastructure projects; cash Waqf may contribute catalytic capital; Waqf institutions may support environmental education and community mobilisation; and productive Waqf revenues may contribute to long-term operation and maintenance. Green Sukuk, meanwhile, can provide the larger investment component required for construction and expansion.

Contribution to Ecological Transition and Sustainable Development

The analysis identifies five areas where an integrated Green Sukuk–Waqf mechanism can aid ecological transition:

1. Renewable Energy- Green Sukuk can finance renewable projects, while Waqf supports community ownership and services, especially in developing economies.
2. Sustainable Infrastructure and Climate Adaptation- Green Sukuk funds infrastructure like transport and waste management, with Waqf enhancing public benefit aspects.
3. Environmental Conservation- Green Waqf preserves environmental assets, supported by Green Sukuk for financial sustainability.
4. Community Resilience - This structure aims to integrate social protection with environmental investment, addressing the needs of vulnerable populations.
5. Sustainable Development Goals - The integrated model aligns with several SDGs, fostering a shift from a project-specific to a multi-dimensional development-financing approach.

Institutional, Regulatory, and Operational Challenges

The analysis identifies six major categories of challenges that may constrain the integration of Green Sukuk and Waqf into a unified financing structure: institutional fragmentation, Shariah governance, accountability and impact verification, limited availability of bankable green projects, regulatory complexity, and institutional capacity constraints. These challenges arise from differences in the legal, financial, governance, and operational characteristics of the two instruments. Green Sukuk generally operates through formal capital-market structures involving investors, issuers, regulators, and project sponsors, whereas Waqf is primarily embedded within philanthropic, charitable, and endowment-based institutional arrangements. Consequently, effective integration requires mechanisms capable of coordinating these distinct institutional logics without undermining the legal and Shariah identity of either instrument.

Institutional fragmentation constitutes a major challenge because Green Sukuk and Waqf may fall under different regulatory, supervisory, and accountability arrangements. Without effective institutional coordination, differences in reporting standards, fiduciary responsibilities, asset ownership, and investment requirements can create uncertainty regarding the allocation and management of blended resources. Shariah governance presents a related concern. An integrated structure must ensure that the contractual relationships, use of proceeds, ownership arrangements, risk allocation, and treatment of Waqf assets remain consistent with relevant Shariah principles. Integration should therefore represent genuine complementarity rather than a superficial combination of two financial labels.

Accountability and impact verification are equally important. An integrated financing structure would need to monitor not only financial performance and Shariah compliance but also environmental and social outcomes. Transparent reporting of proceeds, project allocation, environmental performance, and community benefits is particularly important for reducing the risk of greenwashing and ensuring stakeholder confidence. In addition, the limited supply of adequately prepared and financially viable green projects may constrain the effective deployment of mobilised capital. Projects therefore require appropriate technical preparation, feasibility assessment, environmental screening, and financial structuring before financing can be undertaken. Finally, Waqf institutions may face capacity limitations in managing sophisticated financial instruments, environmental investments, risk-management

processes, and impact-reporting requirements. Institutional capacity building is consequently an essential condition for successful integration.

Table 2. Key Challenges to Green Sukuk–Waqf Integration

Challenge Dimension	Evidence from the Analysis	Potential Implication for Integration	Required Institutional Response
Institutional fragmentation	Green Sukuk and Waqf often operate through different institutional and accountability structures.	Weak coordination may create uncertainty over responsibilities, asset management, and reporting.	Establish inter-institutional coordination mechanisms and clearly defined responsibilities.
Shariah governance	The two instruments have distinct contractual, ownership, and legal characteristics.	Poorly structured integration may compromise Shariah integrity or produce a superficial hybrid.	Develop a unified Shariah governance architecture with instrument-specific safeguards.
Regulatory complexity	Capital-market, financial, environmental, and Waqf regulations may apply simultaneously.	Regulatory overlap can delay project approval and increase transaction costs.	Harmonise relevant regulatory requirements and develop clear guidelines for integrated structures.
Accountability and impact verification	Financial, Shariah, environmental, and social outcomes require simultaneous monitoring.	Weak disclosure may undermine public confidence and increase the risk of greenwashing.	Introduce integrated financial, Shariah, environmental, and social-impact reporting.
Limited bankable green projects	Mobilised capital requires technically and financially viable projects.	Insufficient project pipelines may limit the practical deployment of Green Sukuk proceeds.	Establish project-preparation facilities, feasibility mechanisms, and green-project pipelines.
Institutional capacity	Some Waqf institutions may have limited expertise in complex investment and impact-management processes.	Weak technical capacity may restrict participation in sophisticated blended-finance structures.	Provide specialised training in Islamic finance, investment management, ESG/impact measurement, and governance.

Source: Authors' analysis based on the reviewed literature, Islamic financial principles, policy materials, and selected Green Sukuk and Waqf initiatives.

The evidence presented in Table 2 demonstrates that the principal barriers are not limited to the availability of finance. Rather, they involve the institutional architecture required to connect different forms of capital, governance systems, regulatory requirements, and project-development processes. This finding provides the basis for the integrated framework proposed in the following section.

Proposed Integrated Green Sukuk–Waqf Framework for Ecological Transition

Based on the preceding analysis, the study proposes an Integrated Green Sukuk–Waqf Framework for Ecological Transition. The framework responds directly to the institutional, financial, regulatory, governance, and operational challenges identified above. Rather than treating Green Sukuk and Waqf as interchangeable instruments, the framework assigns them complementary functions according to their distinctive financial and Shariah characteristics.

The framework consists of six interconnected layers.

Layer 1: Green Sukuk Capital Mobilisation

Green Sukuk serves as the principal market-based capital-mobilisation mechanism. Funds are raised from institutional and retail investors and allocated, subject to the relevant Green Sukuk structure and eligibility criteria, to environmentally sustainable projects. This layer provides the scale of capital required for projects involving renewable energy, sustainable infrastructure, clean transportation, water systems, waste management, and climate adaptation.

Layer 2: Waqf Mobilisation

The second layer involves the mobilisation of permissible Waqf resources, including cash Waqf, land, buildings, productive assets, and other endowed resources. Unlike investor-oriented capital, Waqf provides a social-purpose dimension that can potentially support long-term or perpetual community benefits. Waqf resources may therefore contribute land, supporting infrastructure, social facilities, project co-financing, or income-generating assets, depending on the applicable Shariah and legal arrangements.

Layer 3: Project Preparation and Development

The third layer addresses one of the principal constraints identified in the analysis: the shortage of sufficiently prepared and bankable green projects. A dedicated project-development mechanism should identify, assess, structure, and prepare projects before financing. Potential projects include renewable energy, sustainable agriculture, clean-water systems, waste management, green buildings, ecological restoration, sustainable livelihoods, and climate-resilient community infrastructure.

Layer 4: Complementary Investment Structure

At this stage, the Green Sukuk and Waqf components are brought together through clearly defined Shariah-compliant contractual and institutional arrangements. The framework does not assume that the Waqf corpus should be treated identically to investor capital. Instead, each instrument retains its distinctive legal, economic, and Shariah characteristics. Green Sukuk can provide scalable project finance, while Waqf can provide complementary social-purpose resources, land, infrastructure, or long-term support.

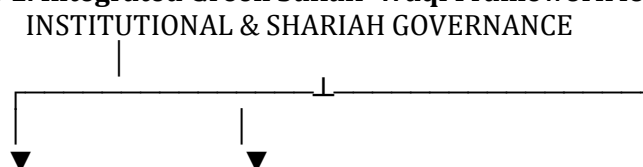
Layer 5: Environmental and Social Implementation

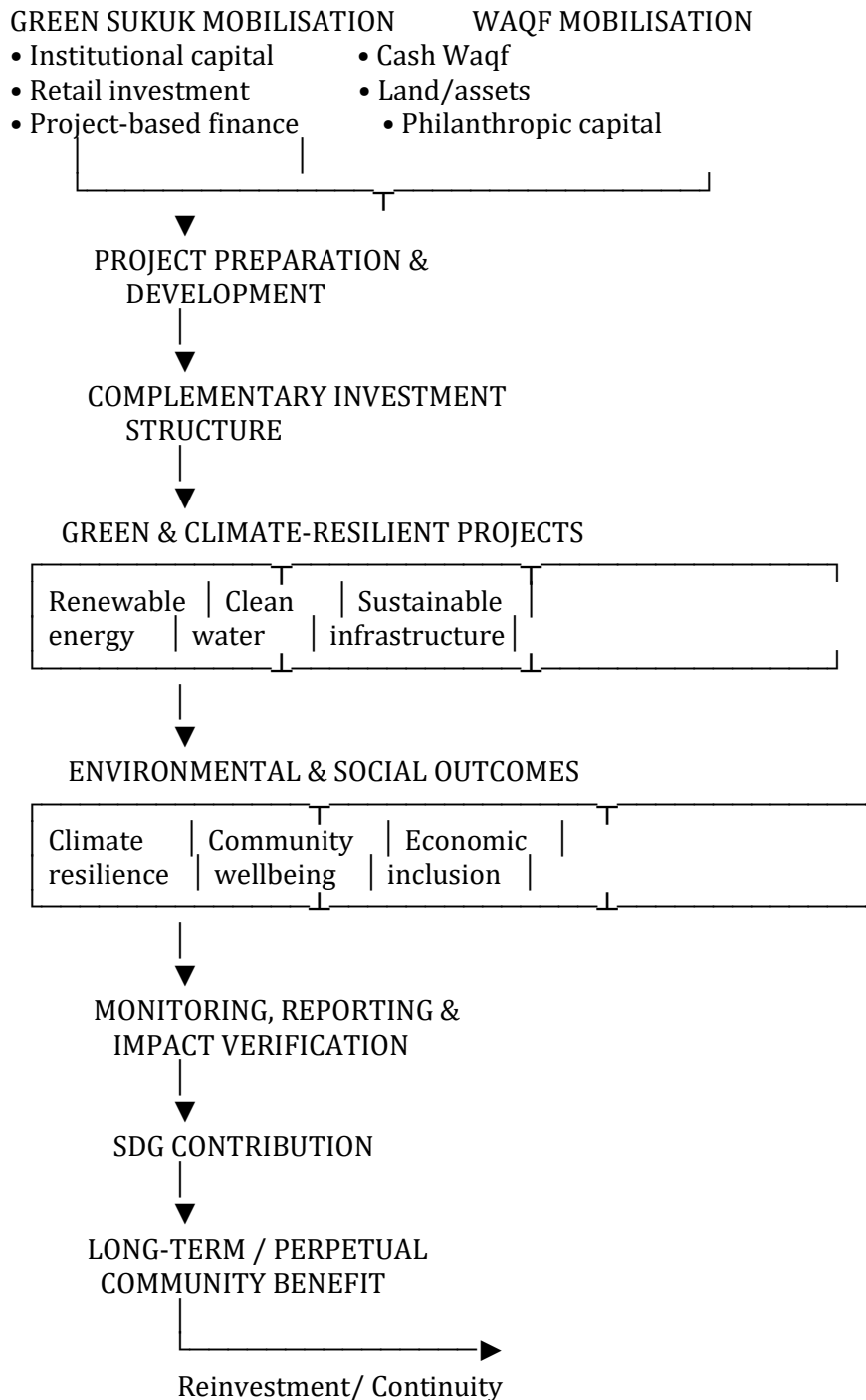
The integrated resources are deployed to projects with clearly specified environmental and social objectives. Environmental outcomes may include renewable-energy generation, emissions reduction, ecosystem restoration, resource efficiency, and climate adaptation. Social outcomes may include employment, affordable services, poverty reduction, community infrastructure, and improved access to essential resources. Community participation should be incorporated particularly where Waqf assets or identifiable community beneficiaries are involved.

Layer 6: Monitoring, Reporting, and Impact Verification

The final layer establishes an integrated accountability mechanism covering financial performance, Shariah compliance, environmental performance, and social impact. Periodic reporting should disclose the allocation and utilisation of funds alongside measurable environmental and community outcomes. Independent Shariah oversight and appropriate environmental and social-impact verification can further strengthen transparency and reduce the possibility of misallocation or greenwashing.

Figure 1. Integrated Green Sukuk–Waqf Framework for Ecological Transition





Source: Authors' conceptualisation based on the findings of the study.

The framework demonstrates that the proposed integration is not simply a matter of combining two sources of Islamic finance. Rather, it represents a project-lifecycle architecture in which Green Sukuk provides scalable market-based capital, Waqf provides socially oriented and potentially perpetual resources, project-development mechanisms convert these resources into bankable investments, and integrated monitoring ensures financial, Shariah, environmental, and social accountability. The final stage creates the possibility of sustaining community and environmental benefits beyond the original financing cycle.

Table 3. Functional Logic of the Integrated Framework

Project Lifecycle Stage	Green Function	Sukuk	Waqf Function	Expected Outcome	Integrated
Capital mobilisation	Mobilises large-scale investment capital.		Mobilises philanthropic and endowment resources.	Diversified financing base.	
Project preparation	Supports financially viable investment structures.		Provides land, assets, community linkages, or social-purpose resources where appropriate.	Increased bankability and relevance.	project and social
Project financing	Provides structured market-based project finance.		Provides complementary or supporting long-term resources.	Blended/complementary financing structure.	
Project implementation	Finances eligible green activities and infrastructure.		Supports community and social components.	Integrated environmental and social development.	
Monitoring and verification	Tracks financial allocation and environmental eligibility.		Tracks Waqf asset utilisation and beneficiary outcomes.	Integrated accountability and impact measurement.	
Post-project sustainability	Operates according to the Sukuk's contractual structure and maturity.		Can potentially provide continuing income or asset-based support.	Greater continuity of environmental and community benefits.	
SDG contribution	Supports climate, clean energy, infrastructure, and sustainable investment objectives.		Supports poverty reduction, social inclusion, community welfare, and environmental stewardship.	Broader contribution to interconnected SDGs.	

Source: Authors' conceptualisation.

Theoretical and Practical Implications

The findings have several implications for Islamic sustainable-finance scholarship. First, they suggest that the conventional distinction between Islamic commercial finance and Islamic social finance should not necessarily imply institutional separation. Green Sukuk and Waqf perform different functions, but these differences can become complementary within a broader financing ecosystem.

Second, the findings extend the sustainability discussion beyond the environmental dimension. A genuinely Islamic ecological-finance model should incorporate environmental stewardship together with social justice, intergenerational responsibility, community welfare, and ethical financial conduct. This is particularly important because ecological transition is not simply a technological transformation; it is also a social and institutional transformation.

Third, the findings suggest that Waqf should be viewed as more than a charitable mechanism. Properly governed productive Waqf can potentially become an important component of long-term sustainable infrastructure and environmental finance. At the same time, Green Sukuk should not be viewed merely as “Islamic green bonds”; its potential contribution lies in connecting capital-market mobilisation with Shariah-based ethical and developmental principles.

Practically, governments and regulators could develop enabling frameworks for Green Sukuk–Waqf structures, including standardised documentation, tax and investment incentives, unified impact-reporting standards, and appropriate Shariah-governance mechanisms. Islamic financial institutions could develop dedicated products that allow Waqf capital to participate in green investment structures without compromising the perpetuity and purpose of the endowment.

Waqf authorities should also strengthen professional capacity in investment management, project appraisal, sustainability assessment, and impact measurement. This would allow Waqf institutions to engage more effectively with contemporary capital markets.

Finally, the framework has potential significance for OIC member states and other climate-vulnerable developing economies. The World Bank has recently emphasised the importance of developing bankable climate projects, expanding Islamic climate-finance instruments, and scaling Waqf and other Islamic social-finance mechanisms to support community resilience and measurable climate outcomes. The proposed framework responds directly to this emerging policy direction by connecting large-scale market finance with community-based and perpetual Islamic social finance.

Overall, the findings suggest that the strongest potential contribution of Green Sukuk and Waqf does not arise from their isolated use. Rather, it emerges from their strategic complementarity: Green Sukuk can provide the scale and investment discipline required for ecological infrastructure, while Waqf can provide social legitimacy, community ownership, long-term purpose, and potentially perpetual support. Their integration therefore offers a promising conceptual pathway toward a more inclusive, ethical, and resilient Islamic sustainable-finance architecture.

CONCLUSION

This study examined the conceptual, structural, and Shariah foundations of Green Sukuk and Waqf as complementary instruments for sustainable development and ecological transition. It critically reviewed relevant literature and contemporary practices concerning Green Sukuk and environmentally oriented Waqf, examined their potential contributions to climate finance, environmental sustainability, and the Sustainable Development Goals (SDGs), and identified the institutional, regulatory, governance, financial, and operational challenges that may constrain their integration. On this basis, the study proposed an Integrated Green Sukuk–Waqf Framework for Ecological Transition that combines the large-scale capital-mobilisation capacity of Green Sukuk with the socially oriented and potentially perpetual characteristics of Waqf.

The analysis indicates that Green Sukuk and Waqf possess distinct but potentially complementary financing capabilities. Green Sukuk can mobilise market-based capital for renewable energy, sustainable infrastructure, climate adaptation, and other eligible environmental projects, while Waqf can provide enduring social-purpose resources, community assets, and long-term support for environmental and social initiatives. Their complementary deployment could therefore broaden the financing base for ecological transition while linking environmental investment with social inclusion, community resilience, and long-term public benefit. However, the realisation of these potential benefits depends on effective institutional coordination, appropriate regulatory frameworks, robust Shariah governance, transparent impact reporting, adequate project preparation, and strengthened institutional capacity.

The study has important limitations. First, it adopts a qualitative and analytical approach and relies primarily on Islamic sources, existing literature, policy materials, and selected Green

Sukuk and Waqf initiatives. Consequently, the proposed framework remains conceptual and has not been empirically tested. The study therefore does not claim that Green Sukuk–Waqf integration has demonstrated causal effects on environmental or socioeconomic outcomes. Second, variations in Waqf laws, capital-market regulations, Shariah governance structures, and institutional capacities across jurisdictions may affect the applicability of the framework in different contexts. Third, the study does not provide quantitative estimates of the financial, environmental, or social returns that could result from integrated financing.

In light of these findings, the study recommends the development of clear regulatory and institutional frameworks for Green Sukuk–Waqf integration, supported by coordination among Waqf authorities, financial regulators, Islamic financial institutions, environmental agencies, and project developers. Shariah governance mechanisms should be strengthened to ensure that integrated structures preserve the distinct legal and ethical characteristics of both instruments. Institutions should also establish transparent systems for financial disclosure, environmental impact measurement, social-impact assessment, and independent verification to strengthen accountability and minimise greenwashing. Furthermore, investment should be directed towards developing bankable green-project pipelines, while Waqf institutions should receive appropriate capacity building in Islamic finance, investment management, project development, risk management, and environmental and social-impact assessment.

Finally, future research should empirically test the proposed framework through comparative case studies, pilot projects, stakeholder interviews, and quantitative assessment of financial, environmental, and social outcomes. Such research would help determine the practical feasibility, scalability, risk characteristics, and developmental impacts of integrated Green Sukuk–Waqf financing across different institutional and geographical contexts. Overall, the study concludes that the integration of Green Sukuk and Waqf offers a promising conceptual pathway for advancing Islamic sustainable finance by connecting market-based capital mobilisation with enduring social-purpose financing. If appropriately governed and empirically validated, this complementary architecture could contribute to a more inclusive, ethical, resilient, and environmentally responsible approach to ecological transition and sustainable development.

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AUTHOR CONTRIBUTIONS

The author conceived and designed the study, developed the research objectives and conceptual framework, conducted the literature and documentary analysis, interpreted the findings, developed the proposed Green Sukuk–Waqf framework, and drafted, revised, and finalized the manuscript. The author also takes full responsibility for the integrity, accuracy, and final content of the work.

USE OF AI TOOLS DECLARATION

Artificial intelligence (AI)-assisted tools were used during the preparation of this manuscript for language refinement, grammatical correction, structural improvement, and editorial polishing. AI tools were not used to generate or fabricate research data, findings, references, or empirical evidence. The author independently developed the research objectives, methodology, analysis, interpretation, conceptual framework, and conclusions and retains full responsibility for the accuracy, originality, integrity, and final content of the manuscript. All AI-assisted outputs were critically reviewed and verified by the author before inclusion in the manuscript.

CONFLICT OF INTEREST

The author declares that there are no financial, personal, professional, institutional, or other conflicts of interest that could have influenced the design, analysis, interpretation, or presentation of the findings of this study.

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