Discover Environment

Review

Operationalising Green Sukuk within the World Bank environmental and social framework

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Received: 15 August 2025 / Accepted: 12 December 2025
Published online: 19 December 2025

Abstract
This paper examines the integration of Green Sukuk—Shariah-compliant sustainable finance instruments—into the World Bank's Environmental and Social Framework (ESF). Green Sukuk have emerged as innovative vehicles for mobilising capital towards renewable energy, climate adaptation, and sustainable infrastructure, yet they currently lack formal recognition within the ESF. Drawing on doctrinal legal analysis, comparative case studies of Malaysia and Indonesia, and policy evaluation, this study argues that formal ESF recognition would elevate Green Sukuk from voluntary ethical instruments to enforceable tools within the global sustainable finance framework. The analysis identifies key challenges of legal enforceability, regulatory fragmentation, and governance inconsistencies, and proposes a six-pillar strategy encompassing ESF-compatible issuance guidelines, harmonised regulatory approaches, dual Shariah–ESF compliance statements, enhanced impact measurement through digital tools, targeted incentives and capacity building, and multilateral support with risk-sharing mechanisms. Comparative lessons from Malaysia's corporate-led model and Indonesia's sovereign issuances demonstrate transferable pathways for aligning Green Sukuk with ESF safeguards. By integrating Islamic finance principles with international sustainability standards, the paper proposes a dual-assurance model that enhances transparency, mitigates greenwashing risks, and expands financial inclusion in Muslim-majority markets. The findings contribute to both Islamic finance and sustainable development scholarship by offering the first systematic framework for embedding Green Sukuk into the ESF, thereby extending their role in advancing the Paris Agreement and Sustainable Development Goals.

Keywords Green Sukuk · Environmental and social framework · Islamic finance · Sustainable development · World Bank · Malaysia · Indonesia · Financial inclusion

1 Introduction

1.1 Overview of Green Sukuk

Green Sukuk have emerged as innovative Shariah-compliant instruments that mobilise capital for renewable energy, climate adaptation, and sustainable infrastructure. Their development in Malaysia and Indonesia has been widely cited as evidence of the growing compatibility between Islamic finance and sustainability objectives [10, 17], Yet, despite their rapid growth, Green Sukuk remain absent from the World Bank's Environmental and Social Framework (ESF), which

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represents the most influential safeguard system for multilateral development bank (MDB) financing. This absence restricts their global recognition and limits their scalability as credible instruments of climate finance.

Existing scholarship has approached Green Sukuk from three main perspectives. The first is an Islamic finance–centric strand, which analyses sukuk structures through the lens of Shariah compliance and ethical prohibitions such as *riba* and *gharar* [4, 9] These works underscore Islamic finance's ethical potential but stop short of exploring integration with international regulatory systems. The second strand emphasises sustainability and ethics, situating Green Sukuk within the discourse on SDGs and ESG reporting [3, 13]. However, these studies typically rely on voluntary frameworks such as the ICMA Green Bond Principles, which remain non-binding and susceptible to inconsistent application. A third strand consists of country-specific case studies, particularly on Malaysia and Indonesia, which document issuance models and regulatory frameworks but remain largely descriptive in scope [10, 17].

Taken together, these strands highlight the promise of Green Sukuk while also revealing a critical gap: there has been little attempt to systematically examine how Green Sukuk could be institutionalised within binding MDB safeguard regimes such as the ESF. This paper addresses that gap by developing a systematic framework for integrating Green Sukuk into the ESF, mapping their principles onto relevant Environmental and Social Standards (ESSs), analysing comparative lessons from Malaysia and Indonesia, and proposing a dual-assurance model that requires both Shariah and ESF compliance. In doing so, the study advances the literature by bridging voluntary ethical instruments with enforceable global standards and demonstrating how Islamic finance can contribute more effectively to inclusive climate finance.

1.2 Importance of ESF integration

Although Green Sukuk are structured to align with environmental, social, and governance (ESG) standards, they have yet to secure formal recognition within the World Bank's ESF. Existing voluntary standards, such as the International Capital Market Association (ICMA) Green Bond Principles, offer pertinent best practices for structuring and verifying green financial instruments; however, these principles are advisory rather than mandatory and lack enforceable supervisory or sanctioning mechanisms [7].

In comparison, the ESF stipulates binding requirements for all World Bank-supported projects, instituting a regime of enforceable safeguards with concrete operational and financial ramifications. The ESF's recognition of a financing instrument entails direct eligibility for multilateral development bank (MDB) funding, access to concessional resources, and integration into advanced environmental and social monitoring systems [20]. Consequently, the integration of Green Sukuk into the ESF would represent an elevation from a voluntary, ethics-based financing tool to a formally sanctioned vehicle within the global sustainable finance architecture [2, 3]. This upgrade would unlock new avenues for capital mobilization and reinforce the standing of Green Sukuk in international markets (Table 1).

The selection of countries for this study is guided by three principal criteria: (1) the existence of significant Muslim populations to ensure cultural alignment and market receptivity; (2) the presence of established Islamic finance infrastructures, including regulatory frameworks and prior sukuk issuances; and (3) urgent climate finance needs coupled with active engagement with multilateral development banks (MDBs), as identified through World Bank Climate Diagnostics and Islamic Development Bank project pipelines [5, 10].

Furthermore, recognising Green Sukuk as an integral element of sustainable finance highlights its vital role in advancing the United Nations Sustainable Development Goals (SDGs). This recognition aligns with the climate finance targets set forth in the 2015 Paris Agreement, which seeks to limit global temperature rise to well below 2 °C. It also echoes the commitments of the Glasgow Climate Pact (COP26), which calls on developed nations and multilateral institutions to substantially increase climate finance flows to developing countries. As a faith-based financial instrument, Green Sukuk have the potential to bridge the climate finance gap by mobilising Shariah-compliant capital for both mitigation and adaptation initiatives.

1.3 Research problem and questions

The lack of formal recognition of Green Sukuk within the World Bank's ESF signifies a significant deficiency in the global sustainable finance architecture. Although these instruments adhere to both Shariah and ESG principles, their absence from formal ESF endorsement detracts from their credibility. It restricts their integration into financing initiatives supported by multilateral development banks (MDBs). This study posits that integrating Green Sukuk into the ESF represents the most credible and effective approach for mainstreaming Islamic sustainable finance on a global scale.

Table 1 Muslim-Majority Regions and Justifications for Green Sukuk Integration within the ESF

World Bank Region	Potential Countries	Justification for Green Sukuk Use
East Asia & Pacific (EAP)	Indonesia, Malaysia	Pioneer of Green Sukuk, strong Islamic finance infrastructure, high climate investment needs
South Asia (SAR)	Pakistan, Bangladesh, Maldives	High climate vulnerability, expanding Islamic banking, need for Shariah-compliant climate finance
Sub-Saharan Africa (SSA)	Nigeria, Gambia, Senegal, Sudan	Emerging sukuk markets, acute climate exposure, limited green infrastructure funding
Middle East & North Africa (MENA)	Egypt, Jordan, Morocco, Tunisia	Active Islamic finance markets, renewable energy ambitions, established MDB engagement
Europe & Central Asia (ECA)	Uzbekistan, Kazakhstan, Turkey	Transition economies with Islamic finance growth, strong IsDB partnerships

Accordingly, the study is guided by three principal research questions:

- RQ1: Which ESSs within the ESF are most pertinent to Green Sukuk, and by what means can compliance with these standards be systematically operationalized?
- RQ2: Should the integration of Green Sukuk be facilitated through ESS9, which pertains to Financial Intermediaries, or is there a need to develop a dedicated ESF guidance note specifically addressing Green Sukuk?
- RQ3: What comparative insights can be drawn from the experiences of Malaysia and Indonesia, particularly when contrasted with conventional green bonds, that are most relevant and transferrable to the process of ESF integration?

1.4 Research methodology

This study adopts a qualitative research methodology that integrates legal and regulatory analysis, case study examination, and comparative evaluation. The legal analysis focuses on existing sukuk regulatory frameworks, with particular attention to Malaysia's SRI Sukuk Framework and Indonesia's sovereign Green Sukuk issuances, evaluating their alignment and compatibility with the ESF safeguards [10, 16].

Case studies provide empirical insights by examining pioneering examples of Green Sukuk, encompassing both corporate-led and sovereign-led issuance models, thereby elucidating practical implementation dynamics and outcomes. The comparative analysis further juxtaposes Green Sukuk against conventional green bonds, delineating their unique strengths and limitations within the sustainable finance landscape [7]. This comprehensive approach facilitates an in-depth understanding of Green Sukuk's potential integration within the ESF.

Methodology	Description
Legal and Regulatory Analysis	Examining existing legal frameworks that govern Green Sukuk, particularly in Malaysia and Indonesia, and evaluating their alignment with the ESF
Case Studies	Analyzing successful Green Sukuk issuances, including corporate and sovereign issuances, to assess best practices, market reception, and challenges
Comparative Analysis	Evaluating how Green Sukuk compares to conventional green bonds in terms of structure, regulatory oversight, and investor appeal
Stakeholder Perspectives	Reviewing reports and policy papers to understand the views of financial institutions, regulators, and investors on Green Sukuk as a sustainable finance instrument
Policy Recommendations	Developing strategic policy recommendations to facilitate the integration of Green Sukuk into the ESF

Policy analysis in this study synthesises perspectives from multilateral development banks, regulatory authorities, and Islamic finance scholars to formulate actionable recommendations for aligning Green Sukuk with the ESF [2, 10]. By integrating these diverse insights, the paper seeks to illustrate how Green Sukuk can effectively bridge the principles of Islamic finance with international sustainability frameworks, thereby enhancing their legitimacy and expanding their contribution to global climate finance initiatives.

This paper offers the first systematic framework for integrating Green Sukuk into the ESF, thereby bridging Islamic finance ethics with binding MDB safeguards and advancing the literature on both sustainable finance and Islamic financial innovation. The remainder of this paper is structured as follows: Sect. 2 sets out the theoretical framework, Sect. 3 reviews the World Bank ESF, Sect. 4 discusses challenges, Sect. 5 presents case studies, Sect. 6 outlines recommendations, and Sect. 7 concludes.

2 Theoretical framework

The integration of Green Sukuk into the World Bank's ESF necessitates a robust theoretical foundation that bridges Islamic finance, sustainable development, and international policy mechanisms. Contemporary scholarship affirms that Islamic finance is not only congruent with sustainability goals but can actively reinforce them through its ethical precepts and contractual structures [3, 9]. This section elaborates on the conceptual basis for integration by positioning Green Sukuk at the confluence of three interrelated domains: the principles of Islamic finance and sustainability, theories of sustainable finance, and international standards, as well as frameworks of governance, accountability, and disclosure.

2.1 Islamic finance principles and sustainability

Islamic finance is founded on prohibitions against riba (interest), gharar (excessive uncertainty), and maysir (gambling), while requiring that transactions are asset-backed and directed toward halal (permissible) activities [5]. These principles align naturally with sustainability goals by discouraging speculative behavior and promoting investments that generate real economic and social value. Sukuk structures such as ijarah (leasing), musharakah (partnership), and wakalah (agency) emphasize risk-sharing and accountability, reducing incentives for excessive leverage and short-term profit-seeking [3].

Empirical evidence supports that Shariah-compliant instruments channel funds effectively into SDG-aligned sectors like renewable energy, affordable housing, and sustainable infrastructure [9]. Consequently, Islamic finance fits within the broader responsible investing ecosystem, where financial returns and ethical outcomes are jointly pursued, making its integration into frameworks like the ESF a convergence of faith-based ethics with universal sustainability standards.

2.2 Sustainable finance and international standards

The expansion of sustainable finance has been underpinned by various international frameworks such as the ICMA Green Bond Principles, the Climate Bonds Initiative, and the EU Taxonomy. Despite their utility in providing guidance, these frameworks are voluntary and see inconsistent implementation across different jurisdictions [7]. In contrast, the World Bank's ESF constitutes a mandatory safeguard system applicable to all projects financed by the Bank, mandating thorough risk assessments, stakeholder consultation, and continual environmental and social oversight [20].

Theoretically, incorporating Green Sukuk into the ESF represents a paradigm shift by elevating these instruments from voluntary ethical guidelines to obligatory safeguard-compliant financial tools. This transformation serves to enhance their credibility and mitigate "greenwashing" risks, a prevalent concern in the domain of sustainable finance [2]. Furthermore, ESF inclusion would equate Green Sukuk with conventional green bonds in terms of enforceability, while preserving their unique Shariah-compliant ethical foundations.

2.3 Governance, accountability, and disclosure

Governance is fundamental to both Islamic finance and sustainable finance. In Islamic finance, compliance is ensured by Shariah supervisory boards that oversee adherence to religious principles. In sustainable finance, governance responsibilities lie with corporate boards and regulatory bodies that uphold ESG standards. This dual governance framework offers potential for complementary oversight but also risks fragmentation when responsibilities are not clearly delineated [5].

Research demonstrates that diverse boards with balanced representation in gender, relevant expertise, and independence tend to provide more comprehensive and higher-quality environmental disclosures. This is because such diversity brings a wider range of perspectives, improved critical evaluation, and greater accountability to environmental risks and opportunities [3].

For Green Sukuk governance, this correlation suggests that incorporating ESG expertise on corporate boards will enhance their ability to report and manage environmental and social impacts transparently. When these boards work alongside Shariah supervisory boards, which ensure religious compliance, the combined oversight enhances both transparency and accountability to the rigorous standards required by the ESF. This complementary governance structure reduces risks such as greenwashing and bolsters stakeholder confidence in the credibility of Green Sukuk financing.

2.4 Bridging Islamic finance and ESF safeguards

The rationale for integrating Green Sukuk into the World Bank's ESF rests on their shared commitment to ethical, inclusive, and sustainable development. Rooted in Shariah principles that emphasize stewardship (khalifah) and justice ('adl), Green Sukuk align with the ESF's objectives of environmental protection, social inclusion, and stakeholder engagement [5, 20]. The ESF also provides operational rigor through standards such as ESS1 (Risk Assessment), ESS5 (Land Acquisition), and ESS10 (Stakeholder Engagement), complementing the ethical assurances of Islamic finance.

This dual assurance framework generates a synergistic effect whereby Shariah boards ensure ethical compliance, while ESF safeguards guarantee enforceability, comparability, and global legitimacy. This integration not only strengthens the credibility of Green Sukuk but also broadens the ESF's reach into underrepresented Muslim-majority markets, advancing both financial inclusion and climate action.

3 Overview of the World Bank's environmental and social framework (ESF)

The World Bank's ESF, introduced in 2018, represents a transformative approach to development finance by integrating sustainability, inclusivity, and accountability throughout project lifecycles [20]. Moving beyond a mere compliance checklist, the ESF establishes a robust framework for identifying, assessing, and mitigating environmental and social risks across all Bank-funded projects. Central to this framework are the ten ESSs, which obligate borrowers to embed safeguarding measures into the design, implementation, and monitoring phases [5, 20].

Aligned with the Sustainable Development Goals (SDGs), the ESF seeks not only to prevent negative impacts but also to amplify positive outcomes such as enhanced climate resilience, labor protections, and stakeholder participation [20]. This framework is particularly relevant to financial instruments such as Green Sukuk, which marry ethical and asset-backed financing mechanisms [5]. Through these global safeguards, the ESF helps ensure that such instruments deliver intended social and environmental benefits while minimizing reputational and operational risks [20].

3.1 Relevant environmental and social standards for green Sukuk

Although the ESF contains ten standards, six are most directly relevant to the design and implementation of Green Sukuk:

- **ESS1: Assessment and Management of Environmental and Social Risks and Impacts.** Requires rigorous environmental and social due diligence, aligning with the Green Sukuk emphasis on asset-backed transparency.
- **ESS2: Labor and Working Conditions.** Resonates with Islamic finance's prohibition of exploitative labor practices and insistence on fairness in contractual relations [5].
- **ESS5: Land Acquisition, Restrictions on Land Use, and Involuntary Resettlement.** Particularly significant for Sukuk-financed infrastructure projects, which often involve solar farms or hydropower facilities.
- **ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources.** Reflects the Islamic stewardship ethic (khalifah), linking environmental conservation with Shariah mandates [9].
- **ESS9: Financial Intermediaries.** Provides a natural entry point for Green Sukuk, as most are structured through banks or corporates acting as intermediaries.
- **ESS10: Stakeholder Engagement and Information Disclosure.** Aligns with Shariah's emphasis on transparency (tabyin) and fairness ('adl), ensuring affected communities are meaningfully consulted.

Framing the ESF through these six standards illustrates why Green Sukuk fit seamlessly within the framework, while also showing the added value of dual assurance from both Shariah boards and ESF monitoring.

3.2 Complementarity between ESF safeguards and Islamic finance ethics

The World Bank's ESF and Islamic finance share a foundational normative commitment to principles of accountability, fairness, and stewardship. Shariah supervisory boards ensure that projects avoid prohibited sectors and promote ethical outcomes, while the ESF complements these principles by enforcing structured due diligence, ongoing monitoring, and grievance redress mechanisms [5, 20].

This complementarity becomes particularly evident in cases where ethical intent alone is insufficient. For example, a renewable energy project financed through Sukuk may meet Shariah compliance criteria but face local opposition due to land acquisition concerns. In such instances, the ESF's ESS5 safeguards are critical in ensuring that resettlement plans are properly executed and that stakeholder engagement processes address community concerns effectively. Thus, the ESF operationalizes and strengthens Shariah principles by embedding them within enforceable, globally recognized sustainability standards.

3.3 Implications for Green Sukuk integration

The integration of Green Sukuk into the ESF transforms them from voluntary ethical instruments into rigorously monitored tools of sustainable finance. Formal recognition within the ESF framework would enhance investor confidence by aligning Green Sukuk with internationally recognized sustainability benchmarks, while also enabling access to concessional financing, risk mitigation mechanisms, and World Bank guarantees [2]. In emerging markets, particularly those with significant Muslim populations, this integration holds the potential to foster financial inclusion by mobilizing previously untapped Shariah-compliant capital towards projects that simultaneously advance global climate goals and local development priorities [9].

Ultimately, the ESF supplies the essential operational foundation to ensure that Green Sukuk issuances are credible, transparent, and comparable on a global scale. Embedding Islamic finance within this framework allows the World Bank to extend the reach of sustainable finance while upholding stringent safeguards and accountability standards.

4 Legal, regulatory, and governance challenges

Although Green Sukuk are well aligned with ESG principles, their integration into the World Bank's ESF is hindered by three interconnected challenges: legal enforceability, regulatory inconsistencies, and gaps in governance and awareness. Overcoming these challenges is essential to establishing Green Sukuk as a credible and mainstream instrument within the global sustainable finance ecosystem.

4.1 Legal enforceability

Green Sukuk are typically structured through Islamic contractual forms including ijarah (leasing), mudarabah (profit-sharing), musharakah (joint venture), and wakalah (agency). While these contracts ensure ethical safeguards and asset-backing, they present enforceability challenges in cross-border transactions. Malaysia, for instance, has established statutory frameworks under the Capital Markets and Services Act 2007 that recognize and enforce Sukuk documentation, thereby mitigating legal uncertainty [16]. Conversely, in certain Gulf Cooperation Council (GCC) jurisdictions, enforceability remains highly reliant on decentralized Shariah rulings, leading to investor uncertainty.

The 2017 Dana Gas Sukuk case exemplifies this vulnerability, where a UAE court initially questioned the enforceability of mudarabah-based contracts, triggering widespread concern in international markets and underscoring the risks posed by legal fragmentation within Islamic finance [18]. Integrating Green Sukuk into the ESF could address these risks by establishing harmonized contractual templates incorporating safeguard-linked covenants under ESS1 and ESS9. Such standardized contracts, endorsed by the World Bank's authority, would promote enforceability across jurisdictions while maintaining alignment with both Shariah principles and internationally recognized sustainability standards.

4.2 Regulatory Inconsistencies

The regulatory landscape governing Green Sukuk remains highly fragmented. Malaysia's Sustainable and Responsible Investment (SRI) Sukuk Framework offers comprehensive disclosure and structuring guidelines, supported by fiscal incentives such as tax deductions on issuance costs [17]. In contrast, Indonesia leverages sovereign credibility and alignment with the ICMA Green Bond Principles to attract international investors (Ministry of Finance Indonesia, 2022). Meanwhile, many Gulf Cooperation Council (GCC) countries regulate Sukuk under broader Islamic finance laws that often lack specific sustainability requirements, rendering "green" classification largely voluntary.

An additional challenge stems from the absence of harmonised Shariah criteria. Jurisdictions apply varying interpretations of what constitutes Shariah-compliant green projects, leading to inconsistencies in eligibility and impact reporting. Unlike conventional green bonds—which benefit from standardised frameworks such as the ICMA Green Bond Principles and the Climate Bonds Initiative taxonomy—Green Sukuk lack a universally accepted benchmark [2]. This deficiency hampers comparability, increases transaction costs, and elevates reputational risk.

The creation of a globally recognised Green Sukuk framework, harmonised with ESF safeguards yet tailored to Islamic finance, would mitigate these challenges. Drawing on lessons from ICMA, such a framework could mandate standardised disclosure templates, certification processes, and unified impact measurement indicators. This would elevate Green Sukuk to a level of credibility and comparability comparable to green bonds, while preserving their unique ethical character [9].

4.3 Governance and awareness

Governance constitutes both a notable strength and a potential vulnerability for Green Sukuk. Issuers are subject to dual oversight mechanisms: corporate boards are responsible for ensuring compliance with standard corporate governance principles, while Shariah supervisory boards are tasked with guaranteeing Islamic legitimacy. Malaysia's centralized Shariah governance structure, overseen by the Securities Commission, promotes consistency and clarity, whereas in the Gulf Cooperation Council (GCC) countries, the decentralized process of fatwa issuance often leads to divergent rulings across different institutions [4].

Empirical studies indicate that greater board diversity—in terms of gender, expertise, and independence—is positively associated with higher-quality environmental disclosures [3]. For Green Sukuk, this suggests that issuers with diverse governance structures and ESG competencies are better equipped to meet the ESF expectations. To enhance governance integrity, the introduction of a joint "ESF–Shariah Compliance Statement," co-signed by both corporate and Shariah boards, is proposed. Such a statement would affirm that Sukuk proceeds are allocated and reported transparently, in compliance with ESS1 and ESS10.

Potential conflicts may arise when Shariah-compliant projects clash with ESF safeguards. For example, a Sukuk-financed renewable energy project might be permissible under Islamic law but entail land acquisition that triggers obligations under ESS5, or provoke community resistance requiring stakeholder engagement under ESS10. In such cases, ESF safeguards should take precedence. Mandating that Shariah boards explicitly attest that their approvals complement, rather than supersede, ESF standards would serve to reinforce investor confidence and bolster the credibility of Green Sukuk governance.

4.4 Synthesis

In conclusion, Green Sukuk face complex challenges posed by overlapping legal jurisdictions, fragmented regulatory frameworks, and multi-layered governance structures. These factors constrain their potential for scalability, hinder cross-border comparability, and affect overall market credibility. Nevertheless, these challenges underscore the distinctive opportunity for Green Sukuk to function as dual-assurance financial instruments, which integrate the moral authority of Shariah compliance with the rigorous sustainability safeguards provided by the ESF (Table 2).

5 Case studies: Malaysia and Indonesia

The development of Green Sukuk in Malaysia and Indonesia presents important case studies that demonstrate the potential of Islamic finance in advancing sustainable development. Malaysia has predominantly pursued a corporate-led issuance strategy supported by a comprehensive regulatory framework, while Indonesia has adopted a sovereign issuance approach leveraging government credibility. These differing approaches highlight key success factors as well as structural challenges, offering valuable and transferable lessons for integrating Green Sukuk within the World Bank's ESF.

5.1 Malaysia's corporate-led model

In 2017, Malaysia pioneered the issuance of the world's first Green Sukuk through Tadau Energy, which financed a 50 MW solar power project in Sabah. This milestone was facilitated by the Sustainable and Responsible Investment (SRI) Sukuk Framework, established by the Securities Commission Malaysia (SC), providing comprehensive guidelines on project eligibility, disclosure, and reporting requirements [16]. Subsequent issuances, notably by Quantum Solar Park and Permodalan Nasional Berhad (PNB), demonstrated the framework's scalability and highlighted the capacity of private-sector entities to participate effectively within a favorable regulatory environment.

A significant advancement in Malaysia is the introduction of the Maqasid al-Shariah Guidance for the Islamic Capital Market (2023), which articulates overarching objectives such as humanity, justice, transparency, and inclusivity. These

Table 2 Green Sukuk Challenges and ESF-Based Solutions

Challenge Area	Nature of the Challenge	ESF-Linked Solution
Legal enforceability	Variability in recognition of Islamic contracts across jurisdictions; Dana Gas case illustrates risks	Standardized contractual templates under ESS1/ESS9; safeguard-linked covenants for enforceability
Regulatory inconsistencies	Fragmented rules; absence of harmonized Shariah/sustainability criteria; no global reporting standard	Development of a Green Sukuk framework aligned with ESF; harmonized disclosure and certification
Governance & awareness	Dual oversight complicates practice; divergent Shariah rulings; limited global familiarity with Sukuk	Joint ESF–Shariah Compliance Statement; board diversity requirements; ESF safeguards take precedence

principles resonate closely with the ESF's focus on fairness, environmental stewardship, and social inclusion, thereby establishing a coherent interface between Shariah compliance and the World Bank's safeguard framework [17].

Malaysia's regulatory clarity and fiscal incentives constitute key strengths by lowering issuance costs and fostering private-sector engagement. Nonetheless, challenges persist, including limited secondary market liquidity, fragmented Shariah governance outside Malaysia, and constrained international recognition, which collectively impede the broader replicability of Malaysia's Green Sukuk model.

5.2 Indonesia's sovereign-led model

Indonesia pioneered the issuance of the world's first sovereign Green Sukuk in 2018, successfully raising USD 1.25 billion to finance projects in renewable energy, reforestation, and sustainable transportation (Ministry of Finance Indonesia, 2018). The sovereign-led nature of this issuance quickly attracted international investor interest by reducing credit risk through government backing and ensuring greater transparency. To further bolster credibility, the Ministry of Finance initiated the publication of annual Green Sukuk Impact Reports, providing detailed information on fund allocation and environmental performance indicators in accordance with international best practices (Ministry of Finance Indonesia, 2022).

The Indonesian approach illustrates that sovereign credibility can effectively compensate for underdeveloped private-sector ecosystems, particularly in emerging markets. Yet, such reliance on government-backed issuances may dampen private-sector dynamism and increase fiscal burdens. Additionally, a sovereign-centric model carries the risk of crowding out smaller issuers, thereby limiting market diversification and broadening of the Green Sukuk sector.

5.3 Comparative lessons

The divergent strategies adopted by Malaysia and Indonesia highlight their respective strengths in developing the Green Sukuk market. Malaysia demonstrates the effectiveness of detailed regulatory frameworks and fiscal incentives in empowering corporate issuers, while Indonesia's sovereign-led approach establishes market trust and accelerates international investor engagement. A systematic comparison of these models elucidates their distinctive features and yields important lessons for the integration of Green Sukuk within the ESF (Table 3).

5.4 Green Sukuk vs. conventional green bonds

A comparative analysis of Green Sukuk and conventional green bonds reveals their markedly distinct structural and assurance frameworks. Green Sukuk are characterized by asset-backing, adherence to Shariah compliance, and incorporation of dual assurance mechanisms through both Shariah and ESG reviews. In contrast, conventional green bonds are primarily debt-based instruments that rely exclusively on ESG standards for assurance. This duality embedded in Green Sukuk enhances their credibility; however, it may also result in higher transaction costs and increased liquidity constraints [9] (Table 4).

5.5 Lessons for ESF Integration

The Malaysian and Indonesian experiences underscore the significance of dual assurance mechanisms in Green Sukuk development. Malaysia's comprehensive corporate disclosure rules and Indonesia's sovereign reporting practices exemplify two approaches that can be adapted to ESF implementation. For the World Bank, a dual strategic approach is likely to be most effective: establishing guidelines for corporate Green Sukuk issuance in accordance with ESS9, while simultaneously piloting sovereign Sukuk issuances supported by multilateral development banks [10, 17].

Formal ESF recognition of Green Sukuk would harness the regulatory stability provided by Malaysia's corporate-led model and the global credibility achieved by Indonesia's sovereign program. This combined strategy has the potential to unlock new sources of Shariah-compliant investment for climate-related projects in underrepresented regions, including South Asia, MENA, and Sub-Saharan Africa [2, 9].

Table 3 Comparative Lessons from Malaysia and Indonesia for ESF Integration

Dimension	Malaysia (Corporate-led)	Indonesia (Sovereign-led)	Direct Implications for ESF Integration
Regulatory base	SRI Sukuk Framework; Maqasid al-Shariah guidance (2023); fiscal incentives	Anchored in state credibility; aligned with ICMA Green Bond Principles; budget law support	ESF can adapt both regulatory clarity and sovereign credibility under ESS9
Transparency	Corporate issuers follow SC disclosure + Shariah review	Annual Green Sukuk Impact Reports disclose use-of-proceeds and KPIs	ESF should require dual assurance: corporate disclosure templates + sovereign reporting
Investor base	Domestic corporates, institutional investors, pension funds	Broad global investors, including MDBs and ESG funds	ESF can leverage Sukuk to mobilize untapped Shariah-compliant capital in Muslim-majority regions
Success factors	Clear guidelines, incentives, early leadership, active SC oversight	Sovereign credibility, regular issuance, transparent impact reports	ESF can replicate both approaches: corporate guidance + sovereign anchoring
Limitations	Small secondary market, fragmented Shariah governance internationally, modest visibility	Reliance on state issuances, higher costs, risk of crowding out private issuers	ESF can mitigate risks via credit enhancement, harmonized Shariah standards, MDB co-financing

Table 4 Green Sukuk vs. Conventional Green Bonds — Distinctive Features and ESF Implications

Dimension	Green Sukuk	Green Bonds	ESF Implications
Structure	Asset-backed; Shariah-compliant contracts (*ijarah*, *musharakah*)	Debt-based; fixed interest	ESF can leverage asset-backing for ESS5 (land rights) and ESS6 (biodiversity)
Assurance	Dual oversight: Shariah boards + ESG reviewers	Single ESG/ICMA assurance	ESF should require dual compliance statements (Shariah + ESF)
Investor base	Attracts Muslim-majority + ESG investors	Primarily ESG investors in conventional markets	ESF recognition expands inclusion in underrepresented Muslim-majority regions
Transparency	Varies; best practice = annual impact reports	Standardized under ICMA/CBI with annual reporting	ESF can harmonize reporting templates to standardize disclosure
Liquidity	Limited secondary market; fragmented Shariah standards	Larger, more liquid market	MDB support (credit guarantees) can reduce Sukuk liquidity risk
Costs	Higher issuance costs due to dual compliance	Lower relative issuance costs	ESF/MDB templates can reduce transaction costs and improve comparability

5.6 Mechanisms and recommendations for integrating green Sukuk into the ESF

Integrating Green Sukuk into the World Bank's ESF goes beyond mere rhetorical alignment; it requires operational clarity, measurable standards, and region-specific pathways for success. Insights from Malaysia's regulatory advancements and Indonesia's sovereign credibility support a six-pillar strategy: creating ESF-compatible issuance guidelines, harmonising regulatory approaches, improving impact measurement with digital tools, providing incentives and capacity building, implementing dual Shariah and ESF compliance statements, and promoting issuance through multilateral support and risk-sharing. These measures offer a practical roadmap for establishing Green Sukuk as credible and scalable tools in global climate finance [2, 9, 10, 14, 20] (Table 5).

Together, these measures provide a roadmap for positioning Green Sukuk as credible, scalable instruments within global climate finance.

5.7 Establishing ESF-compatible guidelines under ESS9

Institutionalising this mechanism under ESS9 would provide Green Sukuk with formal recognition, instil investor confidence through dual accountability, and facilitate comparability with conventional green bonds, all while maintaining their unique ethical characteristics.

Crucially, the operational integration of Green Sukuk into the World Bank's ESF demands that Shariah-compliant principles be explicitly mapped onto the relevant ESSs. This mapping ensures that dual assurances—Shariah legitimacy and ESG safeguards—reinforce one another rather than create overlap or conflict. Parallel approaches have been advocated in prior sustainable finance guidelines, such as the ICMA Green Bond Principles [7] and ESF protocols [20]. Recent scholarship further demonstrates the capacity of Islamic finance instruments to align with international sustainability objectives, including the SDGs, through rigorous compliance and transparent reporting [4, 9]. Building on these precedents, Table 6 offers a practical operationalisation of Green Sukuk alignment with ESF safeguards, providing concrete due diligence steps and applied examples.

5.8 Harmonization and regulatory coordination

Fragmented regulation continues to be a major barrier to cross-border Green Sukuk issuance. The Malaysian SRI Sukuk Framework and Indonesia's sovereign issuance model serve as best practice examples, yet regulatory differences in regions like the Gulf Cooperation Council (GCC) and Sub-Saharan Africa limit scalability. To address these challenges, it is recommended that the World Bank, in partnership with the Islamic Development Bank (IsDB) and national regulatory authorities, organise regulator roundtables and joint working groups to develop harmonised criteria for Shariah-compliant sustainable finance. Anticipated outcomes should include guidance notes—such as Q&A documents—explaining the interaction between ESF safeguards and Shariah rulings, alongside training programmes to standardise supervisory practices across jurisdictions [4]. Achieving regulatory harmonisation would not only reduce issuance costs but also build market trust, ensuring that Sukuk gain equal recognition within the sustainability ecosystem established for ICMA-compliant green bonds.

5.9 Strengthening impact measurement and digital compliance

A key limitation of the current Green Sukuk market is the absence of standardised impact measurement frameworks. Issuers often use informal templates for reporting, which hinders comparability across issuers and raises the risk of greenwashing. By leveraging the World Bank's ESF as a benchmarking tool, issuers should be mandated to adopt a single ESF-aligned template for impact disclosure that directly references relevant ESSs and is verified by independent auditors.

Adoption of emerging technologies can further enhance the credibility of impact measurement and reporting. Blockchain offers a tamper-proof registry for tracking the use of proceeds and impact results; artificial intelligence enables anomaly detection in reported outcomes; and remote sensing supports ongoing monitoring of biodiversity and land-use changes relevant to ESS5 and ESS6 [2]. The integration of these technologies would reduce monitoring costs, improve

Table 5 Mechanism Blueprint for Integrating Green Sukuk into the ESF

Integration Element	Proposed Action	ESF Reference	Output/Deliverable
Recognition pathway	Integrate under ESS9 via an Instrument Note on Islamic Finance	ESS9	Formal recognition of Green Sukuk as ESF-compliant instruments
Compliance assurance	Require dual Shariah–ESF opinion for every issuance	ESS1, ESS9, ESS10	Joint certification that Sukuk meet Islamic ethics and ESF safeguards
Use-of-proceeds standards	Apply standardized templates for project eligibility and allocation	ESS1, ESS6	Ring-fenced funds dedicated to ESF-eligible green projects
Monitoring & reporting	Mandate annual third-party verified impact reports cross-referenced to ESSs	ESS1, ESS5, ESS6, ESS10	Comparable disclosure across issuers; independent validation of outcomes
Digital compliance tools	Encourage blockchain registries, AI anomaly detection, remote sensing	ESS1, ESS6, ESS10	Transparent, near-real-time tracking of flows and environmental outcomes

Table 6 Mapping Green Sukuk Principles to the World Bank's ESF

Green Sukuk Principle	Relevant ESF Standard(s)	Operational Due Diligence under ESF	Illustrative Example
Asset-backed financing	ESS5 (Land Acquisition), ESS6 (Biodiversity)	Verify land rights; prepare and disclose a resettlement action plan (RAP) if involuntary displacement arises; conduct biodiversity assessment before disbursement	A Sukuk financing a solar farm must confirm voluntary land transfers. If households are displaced, an ESS5-compliant RAP must be prepared and disclosed
Ethical investment (no harmful sectors)	ESS2 (Labor), ESS6 (Biodiversity), ESS1 (Risk Management)	Exclude prohibited sectors (alcohol, gambling, fossil-intensive projects); ensure labor rights compliance and biodiversity screening	A Sukuk for palm-oil reforestation is screened to ensure no forced labor and biodiversity offsets are in place
Risk-sharing structure	ESS1 (Risk Assessment), ESS9 (Financial Intermediaries)	Financial intermediaries must demonstrate that risk allocation does not bypass ESF safeguards; disclose risks transparently to investors	A Musharakah Sukuk with joint venture partners requires each partner bank to adopt ESF-aligned due diligence on sub-projects
Stakeholder engagement & transparency	ESS10 (Stakeholder Engagement)	Issuers must publish use-of-proceeds reports, annual impact disclosures, and provide grievance redress mechanisms accessible to affected communities	Indonesia's Sovereign Green Sukuk Impact Report discloses KPIs (e.g., CO_2 avoided) and includes a grievance hotline
Shariah compliance	ESS1, ESS9, ESS10	Shariah supervisory boards must attest that approvals do not override ESF safeguards; dual opinions (Shariah + ESF) are issued for every Sukuk	A hydropower Sukuk requires Shariah approval of contracts plus an ESF compliance note ensuring ESS5 resettlement plans are implemented
Accountability & reporting	ESS1, ESS9, ESS10	Require third-party verified annual impact reports cross-referenced to ESF indicators; proceeds must be kept in ring-fenced accounts	A Malaysian corporate Sukuk must report MWh generated and CO_2 avoided, verified by independent auditors and linked to ESF ESS1/ESS6 metrics

transparency, and increase investor confidence—especially among international investors concerned about opaque reporting practices.

5.10 Pilots, risk-sharing, and multilateral support

Demonstration projects are vital for expanding Green Sukuk within the World Bank's ESF. It is advisable for the World Bank and Islamic Development Bank (IsDB) to launch pilot Green Sukuk programmes in one or two Muslim-majority nations, such as Indonesia for sovereign issues and Nigeria for corporate issues in Sub-Saharan Africa. These pilots should be backed by partial credit guarantees and concessional finance to reduce risk and boost investor confidence. Thorough independent evaluations should take place after the first year to examine operational feasibility, regulatory adherence, and investor reactions. To support this process, a phased action plan is suggested, detailing specific steps for effective scaling and institutional integration (Table 7).

5.11 Incentives and capacity building

Financial incentives and institutional support play a critical role in facilitating the adoption of Green Sukuk. Malaysia's provision of tax deductions and Indonesia's use of sovereign guarantees exemplify how fiscal incentives can effectively lower barriers to market entry. At the international level, multilateral development banks (MDBs) should extend partial risk guarantees and credit enhancement mechanisms to mitigate risks associated with Sukuk issuances in frontier markets. Equally important is capacity building: regulators, Shariah supervisory boards, and financial institutions require comprehensive training on the alignment of ESF and Shariah principles to ensure smooth adoption. Moreover, educational campaigns are essential to increase awareness among global investors less familiar with Islamic finance, while partnerships with academic institutions can provide empirical evidence to refine and optimize future Sukuk frameworks [9].

5.12 Toward a dual-assurance model

Collectively, these recommendations demonstrate that Green Sukuk have the potential to function as dual-assurance instruments, combining moral legitimacy rooted in Shariah law with operational credibility anchored in the World Bank's ESF safeguards. By establishing clear integration mechanisms, harmonizing standards, leveraging digital innovations, and implementing risk-sharing structures, Green Sukuk can transition beyond niche status to become a mainstream financing tool within global climate finance.

6 Conclusion

This paper contends that the integration of Green Sukuk into the World Bank's ESF constitutes a pivotal advancement in the development of inclusive and ethically grounded climate finance. Unlike voluntary frameworks such as the International Capital Market Association (ICMA) Green Bond Principles, the ESF encompasses binding safeguards, supervisory mechanisms, and direct financial implications for multilateral development bank (MDB) activities. Consequently, ESF recognition would elevate Green Sukuk from a niche ethical financial instrument to a mainstream tool with global legitimacy and enforceability [20].

Table 7 Action Plan for Integrating Green Sukuk into the ESF

Action	Responsible Actor	Expected Outcome
Develop ESF-compatible Sukuk guidelines	World Bank + Islamic Development Bank	Provides regulatory clarity and legitimacy
Align reporting with ESF ESS standards	Green Sukuk issuers + World Bank	Improves transparency and comparability
Include Sukuk in WB co-financing	World Bank project teams	Expands financing options for climate projects
Capacity-building on Shariah–ESF	WB + regulators + Islamic banks	Enhances institutional readiness
Pilot Green Sukuk issuances	World Bank + selected pilot countries	Demonstrates feasibility in real-world contexts
Formal revision of ESF guidance	World Bank	Ensures long-term coherence of ESF with Sukuk

The analysis identifies three primary challenges impeding Green Sukuk's attainment of equivalency with conventional green bonds: legal enforceability, regulatory fragmentation, and governance and awareness deficits. These barriers can be surmounted through ESF-aligned reforms including standardized contractual frameworks to enhance transnational enforceability; harmonized Shariah and sustainability compliance criteria to reduce regulatory discrepancies; and the establishment of a dual governance model requiring co-signature of compliance statements by corporate and Shariah supervisory boards to ensure ESF safeguard precedence in cases of discord. These reforms collectively offer investors dual assurance rooted in Islamic finance's moral legitimacy and the ESF's institutional credibility [3, 9].

Comparative case studies from Malaysia and Indonesia elucidate the efficacy of diverse developmental pathways. Malaysia's clear regulatory environment and corporate-led issuance ecosystem exemplify how domestic frameworks can incubate innovation and scalability, whereas Indonesia's sovereign issuance strategy and publication of annual impact reports demonstrate the role of state credibility in anchoring global investor confidence. These models serve as instructive templates for ESF adoption: Malaysia exemplifies a corporate issuance pathway under ESS9, while Indonesia illustrates sovereign issuance leveraging MDB co-financing and reporting structures. Benchmarking Green Sukuk against traditional green bonds reveals its distinctive strength in dual assurance—integrating Shariah compliance with ESG safeguards—albeit amidst ongoing challenges related to liquidity and standardization [4]

Policy recommendations derived from these insights form a coherent operational roadmap, encompassing: the adoption of an Instrument Note on Islamic Finance under ESS9; regulatory coordination to harmonize Shariah and sustainability standards; integration of digital compliance technologies such as blockchain and remote sensing; and implementation of pilot Green Sukuk programs in Sub-Saharan Africa and the Middle East with MDB-enabled credit support. These measures are designed to be both regionally relevant and practically actionable, ensuring the ESF integration of Green Sukuk transcends aspiration to tangible realization [2].

The limitations of this study mainly stem from its empirical focus on Malaysia and Indonesia—countries with relatively developed Islamic finance infrastructures—warning against overgeneralising to less mature markets. This study is primarily a legal-policy analysis, not an empirical econometric investigation; future research could examine the adoption of ESF-compatible Sukuk in pilot markets. Therefore, the proposed framework awaits validation through ESF-aligned pilot issuances. Future priorities include practical evaluations of pilot programmes in contexts such as Nigeria, Pakistan, and Egypt, where demand for Shariah-compliant climate finance is significant but institutional capacity varies. Comparative analyses of Green Sukuk alongside other Islamic financial innovations, including green waqf and carbon credit-linked Sukuk, will further enhance the discussion on Islamic finance's global sustainability role.

In sum, ESF recognition of Green Sukuk transcends symbolism, representing both a financial and ethical imperative. It promises to extend climate finance accessibility within underrepresented Muslim-majority regions, reinforce accountability through dual assurance mechanisms, and embed Islamic finance within the world's premier sustainability framework. By aligning Shariah principles with binding international safeguards, Green Sukuk can bridge ethical finance and development policy, advancing Sustainable Development Goals and the World Bank's mission of inclusive, resilient economic growth.

Acknowledgements The author wishes to express sincere gratitude to the Program in Islamic Law, Harvard Law School, and the American University Washington College of Law for their academic support during the preparation of this paper. This study was funded under the International Islamic University Malaysia Research Initiative Grant Scheme (Publication) (P-RIGS), Grant No. P-RIGS25-143-0143. The author further acknowledges the recognition of this paper as the recipient of the Best Policy Innovation Award, presented at the International Islamic Economics and Finance Conference for Sustainable Development (IFESDC) 2025, held at The World Bank Headquarters, Washington, DC, on 21–22 May 2025.

Author contributions The sole author, Wan Mohd Zulhafiz Bin Wan Zahari, was responsible for the conception, analysis, drafting, and final approval of this manuscript.

Funding This research was supported by the U.S. Department of State through the Hubert H. Humphrey Fellowship Program for 2024–2025, administered by the Bureau of Educational and Cultural Affairs. This study was also funded under the International Islamic University Malaysia Research Initiative Grant Scheme (Publication) (P-RIGS), Grant No. P-RIGS25-143-0143.

Availability of data and materials Not applicable.

Declarations

Ethics approval consent to participate Not applicable.

Consent for publication Not applicable.

Competing interests The authors declare no competing interests.

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