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Forestry Green Sukuk Model: Harmonizing *Hifz al-Bi'ah* for Sustainable Restoration in Indonesia

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Abstract. The increasing intensity of hydrometeorological disasters in Indonesia, such as flash floods and landslides, is directly proportional to the rate of national forest degradation. Mitigation efforts through forest restoration face a structural barrier: a funding gap that cannot be fully covered by the state budget. Although Indonesia has issued Green Sukuk, its allocation remains concentrated in the energy and transportation infrastructure sectors, while the high-risk forestry sector remains neglected. This study aims to construct a Forestry Green Sukuk model that harmonizes the principle of environmental preservation (*Hifz al-Bi'ah*) with modern Islamic financial engineering. The research method employed is normative legal research using a conceptual and statutory approach to analyze the DSN-MUI Fatwa, OJK regulations, and the Presidential Regulation on Carbon Economic Value. The research findings indicate that the use of the Ijarah Maushufah fi Zimmah (IMfZ) contract for the leasing of future asset benefits is the most appropriate structure to mitigate biological risks and uncertainty (gharar) in forestry projects. Unlike profit-sharing schemes, the IMfZ model provides cash flow certainty by monetizing ecosystem services, specifically carbon sequestration and flood mitigation, as valid underlying assets. This study offers a theoretical contribution to the paradigm shift in *Hifz al-Bi'ah* and provides practical solutions for regulators to develop bankable alternative financing schemes that support climate resilience and disaster risk reduction targets in Indonesia.

Keywords: Green Sukuk, Forest Restoration, Ijarah Maushufah fi Zimmah, *Hifz al-Bi'ah,* Sustainable Finance.

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INTRODUCTION

Indonesia is now at a critical point in its environmental management narrative (Supangat et al., 2023). Tropical forests, which have long been a source of pride as the lungs of the world and a buffer for ecosystems, are experiencing alarming degradation. The impact of this damage is no longer just a scientific prediction on paper; it has manifested as real and deadly hydrometeorological disasters (Indrajaya et al., 2022). The series of disasters in November and December 2025 is undeniable proof of this. The flash floods that hit West Sumatra, Aceh, and North Sumatra sent a clear message that nature's carrying capacity has exceeded its tolerance limits due to uncontrolled deforestation and land-use change (Gustati, 2025).

This phenomenon requires a rapid mitigation response, one of which is through massive forest restoration. However, efforts to restore forest ecosystems face complex structural constraints, namely a funding deficit (Puspitaloka et al., 2021; Sasmito et al., 2023). Based on data from PPN/Bappenas, Indonesia is estimated to need US$757.6 billion to achieve its climate targets (Alatas, 2025), an amount that is impossible to cover entirely by the State Budget (APBN). These fiscal constraints create a financing gap that hinders the pace of critical land rehabilitation. On the other hand, Islamic financial instruments, particularly Green Sukuk, have emerged as a promising financing innovation (Faizi et al., 2024; Hiljannah et al., 2023). Since its initial issuance in 2018, Indonesia has been recognized as a global pioneer of Sovereign Green Sukuk. However, the allocation of green sukuk funds has so far been concentrated in the transportation and renewable energy sectors (Alhaq et al., 2023; Anjani et al., 2024; Endri et al., 2022), while the forestry sector, which is at the root of natural disasters, has not received an optimal and specific share of the financing scheme.

Based on these academic concerns and empirical realities, this study was conducted with the primary motivation of bridging the gap between the urgency of environmental improvement and the availability of Sharia financing instruments. The motivation for this study was driven not only by the pragmatic need to prevent disasters, but also by a theological calling. From an Islamic perspective, protecting the environment is a manifestation of *Hifz al-Bi'ah*, an important derivative of the objectives of Sharia (*Maqashid Syariah)* that aims to protect human survival (Khuluq & Asmuni, 2024; Rois et al., 2024). The absence of a specific financing model for forests suggests that the integration of environmental conservation principles with Islamic finance and modern financial engineering has not been fully explored.

These conditions give rise to specific challenges and a fundamental research gap. Various studies confirm that although Green Sukuk instruments are growing rapidly, their allocation remains concentrated in the renewable energy, sustainable transportation, and physical infrastructure sectors (Faizi et al., 2024; Hiljannah et al., 2023; Ihsan, 2025). Conversely, the forestry sector, which is, in fact, the cornerstone of climate crisis mitigation, is often sidelined and appears only implicitly within conservation themes (Fitrah & Soemitra, 2022; Liu & Lai, 2021). Some recent literature reviews even explicitly identify ecological domains, including forest conservation, as "areas requiring immediate attention" for funding allocation, prompting conceptual discussions about the need for specialized instruments such as forest sukuk (Alam et al., 2023; Foglie & Keshminder, 2024; Rahman et al., 2022).

Ironically, the conceptual discourse on forest financing has not yet been followed by the development of a comprehensive contractual model. The majority of current literature remains focused on discussions of Green Sukuk at the macro level-such as general instruments, maqasid syariah, legal frameworks, and standards (SRI/green sukuk, DSN fatwas, sustainable financing)-without addressing sector-specific contract designs (Alifia & Fakhriah, 2024; Foglie & Keshminder, 2024; Liu & Lai, 2021; Lubis & Windiana, 2024; Supriyadi et al., 2023). This is due to the perception that land-based green projects entail high levels of biological uncertainty, are long-term, and pose complexities in impact measurement. To date, there is virtually no literature that rigorously dissects Sharia contract innovations or risk-sharing frameworks to address this uncertainty in biological carbon valuation, thereby enabling market acceptance of forestry projects (Fitrah & Soemitra, 2022; Rahman et al., 2024).

The absence of a comprehensive, dedicated financing model is an urgent issue; allowing this gap to persist is tantamount to letting the rate of forest degradation exacerbate the frequency of hydrometeorological disasters. Responding to this pragmatic and theological call, this study bridges the gap in the literature by shifting the thematic focus of the Green Sukuk discourse from a dominance of physical infrastructure toward the financing of ecological restoration. This study also offers a technical innovation in the form of a hybrid contract-a combination of Wakalah and Ijarah Maushufah fi Zimmah (IMfZ)-as a way out of the impasse regarding long-term biological risks. This hybrid contract enables the monetization of future ecosystem services (such as carbon sequestration) into valid and measurable underlying assets.

To ensure the robustness of the analysis of this innovation, this study examines the proposed model's compliance with Financial Services Authority (OJK) regulations as well as the

jurisprudential basis of fatwas, specifically DSN-MUI Fatwa No. 137/DSN-MUI/IX/2020 on Sukuk, DSN-MUI Fatwa No. 101/DSN-MUI/X/2016 on Al-Ijarah Al-Maushufah Fi Al-Dzimmah, and MUI Fatwa No. 86 of 2023 on Global Climate Protection. Within this argumentative framework, the primary objective of this research is to develop a tailor-made Forestry Green Sukuk model to finance sustainable forest restoration. Through this prescriptive design, it is hoped that risks can be mitigated fairly, a bankable financing scheme can be provided in accordance with Sharia principles, and tangible solutions can be offered for disaster resilience in Indonesia.

LITERATURE REVIEW

This literature review aims to critically evaluate the development of academic discourse on the integration of environmental sustainability principles in Islamic financial instruments. To address the complexities of sustainable financing, this section explicitly structures and synthesizes the existing literature into three clearly defined streams of scholarship: (1) the reinterpretation of *Maqashid Syariah* and institutional fatwas in the context of ecology (*Hifz al-Bi'ah*), (2) the dynamics of Green Sukuk implementation within the Sharia legal framework, and (3) the structural challenges in forestry sector financing. Through this synthesis, this study identifies theoretical and practical gaps that necessitate the design of a specialized sukuk model for forest restoration.

1. Paradigm Shift: From Profit Maximization to Hifz al-Bi'ah and Climate Fatwas

Classical Islamic economic literature generally treats environmental protection as a secondary concern, but contemporary studies indicate a dynamic shift in this paradigm. The modern *Maqashid al-Sharia* approach emphasizes that the protection of property (*hifz al-mal)* and life (*hifz al-nafs*) must be understood within the framework of sustainable well-being rather than merely as individual ownership (Harahap et al., 2023; Rois et al., 2024; Yusuf et al., 2023). These scholars offer a critical interpretation: *Hifz al-Bi'ah* (environmental preservation) is no longer a supplementary goal but an absolute prerequisite for achieving economic stability and human safety. Without a healthy environment, the fundamental pillars of life and the economy cannot be sustained.

A systematic review conducted by Harahap et al. (2023) shows that Islamic financial instruments-specifically zakat, waqf, and sukuk-are now directly linked to social and environmental sustainability goals (SDGs) and are no longer limited to commercial motives.

To provide institutional legitimacy to this academic consensus, the Indonesian Ulema Council (MUI) has issued MUI Fatwa No. 86 of 2023, titled "Legal Ruling Regarding the Protection Against Global Climate Change." The existence of this fatwa is crucial because it successfully elevates the discourse on environmental conservation from merely an abstract philosophical discussion to a binding religious obligation. This provides a strong moral foundation and jurisprudence for the development of pro-environmental Islamic financial products.

Although this theoretical and institutional consensus is growing stronger, some scholars have criticized the *Hifz al-Bi'ah* discourse for remaining vulnerable to becoming trapped in a rhetorical "ivory tower" without empirical support (Irfany et al., 2024). While Green Sukuk financing schemes for renewable energy have provided an initial example, the standardization of sharia-environmental compliance screening in other contracts, such as murabahah and ijarah, remains very limited (Alam et al., 2023; Almustafa, 2025). There is a clear gap between the rhetoric of the "Green Sharia Economy" and the technical architecture of its products. Therefore, the greatest research opportunity currently lies in the urgent need for specific contract designs, binding environmental screening standards, and product architectures that bridge the principles of *Hifz al-Bi'ah* and Sharia with technical implementation in the capital markets.

2. Dynamics of Green Sukuk Implementation and the Sharia Legal Framework

Several empirical studies indicate that the current implementation of Indonesia's Sovereign Green Sukuk is dominated by funding directed toward "hard" infrastructure sectors, such as renewable energy, energy efficiency, sustainable transportation, waste management, and climate resilience in disaster-prone areas (Jalili et al., 2025; Suriani et al., 2024). Although funding for ecological sectors such as forestry, conservation, and sustainable agriculture is explicitly listed as eligible, the actual proportion of funding allocated to these sectors remains very small and marginalized in practice (Faisal et al., 2023; Faizi et al., 2024). This reality highlights an asymmetry between ecological urgency and the country's portfolio preferences for financing.

There is not much literature that attempts to synthesize the potential for new revenue from carbon trading as an underlying asset for sukuk issuance. In fact, Presidential Regulation No. 98 of 2021 concerning Carbon Economic Value has opened up this opportunity. This study argues that the existing literature has not comprehensively explored the use of hybrid contracts,

such as a combination of Wakalah (for management) and Ijarah Maushufah fi Zimmah (lease on future assets), as a middle ground solution to overcome forestry investment risks.

3. Forestry Financing Challenges and the Gap in Hybrid Contract Models

The literature on forestry economics agrees that the main challenge of forest restoration is the maturity mismatch between costs incurred at the outset and returns (wood or carbon) obtained decades later (Löfqvist et al., 2023; Sheikh et al., 2025; Sinacore et al., 2023). In conventional financial literature, the solutions offered are blended finance or grant funds (Jang et al., 2023; Quesnel Seipp et al., 2023). Literature on Forest Waqf is beginning to emerge, but its scale is considered too small to address the massive forest destruction in Sumatra and Kalimantan. Studies on Forest Waqf in Indonesia show that it is effective in increasing socio-economic benefits (26.4% contribution) and ecological restoration (13.9%), and that it is managed in accordance with Sharia and national law (Candra et al., 2024). The scale remains local, supporting the observation that the forest waqf has not yet addressed the massive damage. Green finance literature generally highlights green bonds and their connection to the carbon market, but does not specifically examine carbon-based sukuk or hybrid sharia contracts for forest restoration (Zhang & Umair, 2023). No studies were found that explicitly designed forest restoration sukuk with underlying carbon/biomass credits utilizing contracts such as Wakalah + Ijarah Maushufah fi Zimmah. The focus of studies is more on the design of conventional instruments and carbon market risk reduction (Blanton et al., 2024; Elias et al., 2024; Yukun & Haiquan, 2023).

The root of this allocation imbalance is closely tied to the issue of financial product standardization. A systematic review of global green sukuk highlights that projects considered "bankable" and attractive to investors are generally limited to energy and transportation infrastructure. Meanwhile, land-based assets (agriculture and forestry) are far more difficult to identify, measure, and package into underlying assets capable of meeting both the strict standards of capital markets and Sharia compliance criteria (Alam et al., 2023; Ihsan, 2025). Ironically, the literature critiquing these barriers often fails to explore the flexibility in jurisprudence that Sharia authorities in Indonesia have actually provided. The National Sharia Council (DSN-MUI) has, in fact, laid a highly progressive legal foundation through Fatwa No. 137/DSN-MUI/IX/2020 on Sukuk and Fatwa No. 101/DSN-MUI/X/2016 on Al-Ijarah Al-Maushufah fi al-Zimmah. Legally, these two fatwas legitimize the use of "future asset benefits"

as the object of a transaction, a concept that is crucial for overcoming the biological constraints of forestry projects, which require a long time to generate economic value.

In other words, a synthesis of the existing literature confirms a paradox that serves as the central focus of this study. The macro-level instrument (Green Sukuk) is already in use globally, and the jurisprudential foundation for facilitating future assets has been issued; however, the specific contractual structure that bridges the two to cover risks in the forestry sector has not yet been precisely formulated. The absence of academic elaboration linking the DSN-MUI fatwa mandate to the product's technical architecture serves as the entry point for this study to develop a precise contract formulation.

Based on the above synthesis, there appears to be a paradox: the need for forest financing is urgent due to disasters (such as flash floods in Sumatra), yet academic literature has yet to provide an adequate sharia financing framework (model) for this sector. Previous studies tend to be polarized between two extremes: abstract philosophical discussions of *fiqh al-bi'ah*, or technical discussions of green sukuk that are biased towards the energy infrastructure sector. Therefore, this study fills this gap by constructing a Green Sukuk model specifically designed for forest restoration, integrating forestry risk mitigation into the structure of sharia contracts.

METHOD

This study adopts a qualitative approach using normative legal research methodology. The choice of this research design is based on the study's primary objective, which is to develop a prescriptive model for a financial contract that integrates Sharia norms and applicable positive regulations (J. Ibrahim, 2006; Marzuki, 2017; Sugiyono, 2017). This approach allows the researcher not merely to describe existing laws but to explore legal principles (conceptual approach) and harmonize legislative products (statute approach) to fill regulatory gaps in forest restoration financing schemes.

To ensure methodological coherence and analytical rigor, the data collection process was conducted through a systematic review of the literature and official documents. The search for academic literature and secondary documents was focused using a combination of specific keywords, namely: "Green Sukuk," "Forest Restoration," "Ijarah Maushufah fi Zimmah," and "*Hifz al-Bi'ah*." This search was limited to literature published within the last decade to ensure the research remains up to date.

In addition to academic literature, the primary units of analysis in this study rely on authoritative documents. To ensure transparency and accountability regarding the data sources used, all reviewed documents have been systematically classified and organized. Based on recommendations for qualitative document analysis methods (Bowen, 2009; Mackieson et al., 2019), these document types were categorized into four main groups: (a) Fatwas, (b) White Papers (Frameworks), (c) Government Documents, and (d) Other Relevant Materials. Details of the document distribution are presented in Table 1.

Table 1. Categorization and Distribution of Documents Used

Document Category	Description / Main Document Title	Number/ Distribution
a) Fatwas	a. (Fatwa of the National Sharia Council—Indonesian Ulema Council on Sukuk, 2020) b. (Fatwa of the National Sharia Council—Indonesian Ulema Council on the Al-Ijarah Al-Maushufah Fi Al-Dzimmah Contract, 2016) c. (MUI Fatwa No. 86 of 2023 on the Ruling on Global Climate Change Mitigation, 2023) d. (Sharia Compliance Statement for Retail State Sukuk Series SR01B and SR019 of 2023, 2023)	4 Key Documents
b) White Papers	The Republic of Indonesia Green Bond/Sukuk Framework (Ministry of Finance of the Republic of Indonesia, 2018; Minister of Finance of the Republic of Indonesia, 2025)	2 Key Documents
c) Government Documents	a. POJK No. 60/POJK.04/2017 (Environmental Impact) (Issuance and Requirements for Environmentally Friendly Debt Securities (Green Bonds), 2017) b. Presidential Regulation No. 98 of 2021 (Carbon Economic Value) (Presidential Regulation Of The Republic Of Indonesia No. 98 OF 2021, 2021) c. BNPB Disaster Data (2024) (National Disaster Management Agency, 2024)	3 Key Documents
d) Other Relevant Materials	a. Articles in Reputable International/National Journals (Scopus/Sinta) b. Contemporary literature on Fiqh al-Muamalah	> 30 Articles/ Books

Source: Processed by Author (2026)

All data compiled in the matrix in Table 1 were then analyzed using a qualitative-constructive analysis method. This analysis went through two main filtering stages that served as instruments to measure the model's validity. First, the sharia compliance test; this stage examined fatwa documents to ensure that the underlying asset component (future ecosystem services) and the fund flow mechanism were free from elements of riba, gharar, and maysir.

Second, the regulatory feasibility test; this stage examines government documents (such as POJK and Presidential Regulations) to ensure the proposed model's compatibility with Indonesian positive law. The final results of this analysis are synthesized using the Maqashid Syariah approach to produce a Forestry Green Sukuk structure that is legally valid in the capital market while having a tangible impact on ecosystem conservation (*hifz al-bi'ah*).

RESULTS

This section presents the main findings from the normative data analysis and the construction of the financing model that have been carried out. The findings are presented in two main sections: (1) Gap analysis between existing Green Sukuk allocations and forestry funding needs, and (2) Construction of a proposed Forestry Green Sukuk contract model as a solution. The data is presented descriptively to provide a comprehensive overview of the issue's urgency, followed by a prescriptive analysis of the sharia-compliant contract structure.

1. Indonesian Green Sukuk and the Forest Restoration Financing Gap

An analysis of the Green Sukuk issuance landscape in Indonesia reveals a striking asymmetry in allocation between the physical infrastructure and natural conservation sectors. Funding realization for Sovereign Green Sukuk in the early stages of issuance (2018–2023) showed a heavy bias toward the sustainable transportation and renewable energy sectors (Abubakar & Handayani, 2020; Rahman et al., 2022). The latest empirical data confirm that this imbalance trend continues to this day. Of the total cumulative issuance value reaching USD 5.5 billion by 2024, the dominance of the physical infrastructure sector remains unshaken (Ihsan, 2025). As represented in the estimated funding allocation in Table 2, the energy and transportation sectors account for more than half of the funding. Conversely, the biodiversity conservation and climate change adaptation sectors, which are the primary focus of forestry projects, receive only a marginal share of 10% each.

Table 2. Estimated Allocation of Funds for Indonesia's Green Sukuk (2024–2025)

Project Sector	Allocation Percentage (%)	Estimated Amount (IDR)
Renewable Energy	35%	7,000,000,000,000
Sustainable Transportation	25%	5,000,000,000,000
Waste and Water Management	20%	4,000,000,000,000
Biodiversity Conservation	10%	2,000,000,000,000
Climate Change Adaptation	10%	2,000,000,000,000

Source: Adapted from data obtained from the OJK

This bias creates a real financing paradox. The funding needs for the forestry sector are projected to reach USD 5.6 billion (Rahman et al., 2022), a staggering figure that far exceeds the 10% share of the currently available allocation. Although the Republic of Indonesia's Green Bond/Sukuk framework document explicitly includes "natural resource management" as an eligible sector, empirical evidence indicates that this sector has not become a dominant beneficiary (Fitrah & Soemitra, 2022). This gap confirms that the current sukuk mechanism has not yet bridged Indonesia's ecological vulnerability gap.

The root cause of the low uptake in this ecological sector lies not only in market preferences but also in structural barriers on the supply side at the local level. A recent study found that local governments often lack the technical capacity and adequate understanding to design green projects, particularly in the forestry sector, that are commercially viable and bankable for financing through sukuk schemes (Pujiantoro et al., 2021). As a result, the potential to restore critical land in various disaster-prone regions is not packaged into attractive investment prospectuses, thereby widening the gap between the urgency of local-level mitigation and the availability of funds at the central level.

From the perspective of the capital market, the risk profile of the forestry sector is indeed considered too high (Fitrah & Soemitra, 2022). Furthermore, there is a conceptual gap between global sustainability criteria and strict Sharia compliance standards. A literature review demonstrates that not all projects labeled "green" can technically be immediately categorized as Sharia-compliant if they still contain potential harm or a level of uncertainty (*gharar*) that violates the provisions of muamalah fiqh (Rohmah et al., 2020). In the context of forest restoration, the risks of growth failure and wildfires constitute a natural form of gharar, prompting Sharia supervisory boards and investors to exercise caution.

In addition to the challenge of *gharar*, the effectiveness of green financing instruments depends heavily on the accountability of environmental impact reporting. The challenges that have long overshadowed the issuance of green sukuk include the lack of integrated emissions data and the limited capacity to measure on-the-ground impacts (Mutmainnah & Romadhon, 2023). Failure to demonstrate measurable environmental impacts can undermine the credibility of these instruments in the eyes of global investors, leading to an increasing avoidance of intangible projects such as reforestation.

All of the structural weaknesses and risks mentioned above are exacerbated by a lack of technical innovation in the sovereign sukuk instruments themselves. The majority of Sovereign

Green Sukuk are currently issued using a standard Ijarah structure (leasing of physical assets) (Alhaq et al., 2023). This structure absolutely requires that the leased asset (*ma'jur*) and its benefits (*manfa'ah*) must already exist at the time the contract is signed. This requirement for the asset's physical existence creates a fatal methodological clash with the forestry sector. Forest ecosystems require a gestation period of over a decade before they can produce "ecosystem services" that can be leased in measurable quantities to cover the impact report.

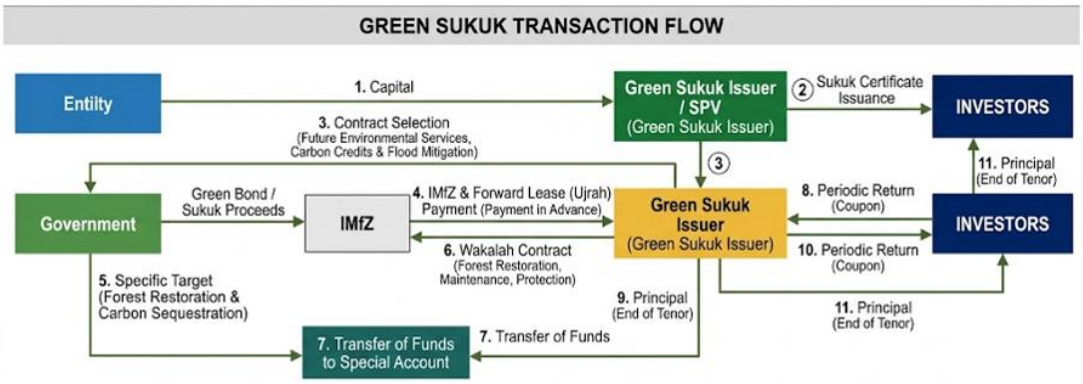
It is the inability of standard Ijarah contracts to accommodate this maturity mismatch that serves as the primary analytical link explaining why the forestry sector has been marginalized. There is an extreme time mismatch: forestry projects require massive injections of operational capital at the outset, while tangible benefits will only materialize in the future. The failure of current instruments to bridge this temporal gap demonstrates that the structure of standard sukuk is fundamentally incompatible with forestry projects.

In response to this structural impasse, regional capacity constraints, high levels of gharar, and the rigidity of such contracts, precise financial engineering innovations are required. This need is addressed through the construction of the Ijarah Maushufah fi Zimmah (IMfZ) model. The application of this modified contract validates the urgency of converting "future environmental performance" into a legally valid economic asset. Thus, the IMfZ model provides a robust operational solution to overcome the methodological barriers of existing instruments, thereby achieving the sustainability of Indonesia's forests.

2. Construction of a Green Sukuk Model Based on Ijarah Maushufah fi Zimmah (IMfZ)

To address the structural risks outlined earlier, this study constructs a new model that synergistically harmonizes the principle of *Hifz al-Bi'ah* with financial risk mitigation. Contrary to the initial hypothesis that might have considered Musyarakah (a profit-sharing contract) as the ideal solution, the results of the fiqh analysis indicate that *Musyarakah* carries an excessively high risk of *gharar* (uncertainty of outcome) for retail investors, especially given forests' high biological vulnerability to growth failure or fire. Therefore, such equity-based instruments are deemed unsuitable for financing public reforestation projects. As a precise alternative, the study's findings recommend a hybrid contract with Ijarah Maushufah fi Zimmah (IMfZ) as the core contract. IMfZ enables the leasing of benefits from assets that are not yet physically tangible but have precisely measurable specifications (future ecosystem services). In this model, "forest benefits" (in the form of carbon sequestration and flood prevention) are valued as valid underlying assets. These intangible assets can then be leased to

the government, as the party benefiting from reduced disaster risk, or commercialized on the global carbon market (see Figure 1 for details on the Forestry Green Sukuk Transaction Scheme).



1. Capital (Investors purchase Sukuk, funds go to SPV Issuer).

2. Sukuk Certificate Issuance (from SPV to Investors).

3. Contract Selection (Future Environmental Services, Carbon Credits & Flood Mitigation)

4. IMfZ & Forward Lease (Ujrah) Payment (Payment in Advance): The core of this structure lies in the use of the IMfZ contract (Forward Lease). The proceeds from the sukuk issuance are transferred by the SPV to the Government as a forward lease payment, which serves as working capital.

5. Specific Target (Forest Restoration & Carbon Sequestration)

6. Wakalah Contract (Forest Restoration, Protection)

7. Transfer of Funds

8. Periodic Return (Coupon) Revenue is obtained from lease payments (state budget for disaster mitigation or sale of Carbon Credits). Returns are distributed to investors periodically as a Periodic Return (Coupon)

9. Principal (End of Tenor)

10. Periodic Return (Coupon) Periodical Periodic Return Return (Coupon) from SPV to Investors.

11. Principal (End of Tenor)

Figure 1. Forestry Green Sukuk Transaction Scheme (Forestry Green Sukuk Model)

Initiation Phase: Resolving Maturity Mismatch

This transaction scheme begins with the initiation phase (Steps 1 & 2), in which the Entity (as the initiator) and the Government, through a Green Sukuk Issuer or Special Purpose Vehicle (SPV), issue sukuk certificates to raise capital from the public (Investors). The selection of the IMfZ at this stage (Step 3) constitutes an essential legal innovation. Through the IMfZ,

investors are permitted to enter into a legally binding contract even though the leased asset, namely "Future Ecosystem Services" (such as carbon sequestration and flood prevention), will not become available for many years. The proceeds from the sukuk issuance are then channeled by the SPV to the Government as an upfront lease payment or Forward Lease (*Ujrah*) Payment (Step 4). This initial inflow of fresh funds serves as working capital for the restoration project, thereby systematically resolving the maturity mismatch that has long prevented forest projects from securing initial funding.

Implementation Phase: Transforming Ecological Functions into Economic Assets and Addressing Regional Challenges

Once funds have been raised, the mechanism proceeds to the project implementation phase (Steps 5 & 6). At this stage, the project is tied to specific targets involving forest restoration and carbon sequestration (Step 5). For its implementation, a supplementary agreement in the form of a *Wakalah* (agency) is used (Step 6). The government acts as the *Muwakkil* (principal), appointing the project implementer, such as the Ministry of Environment and Forestry (KLHK) or local governments, as the Agent to carry out comprehensive reforestation activities (restoration, maintenance, and protection). At this stage, the underlying asset is revolutionarily defined broadly, not merely as physical tree trunks, but as "rights to future ecosystem services." This expanded definition of the asset is crucial to ensure the project has a valid economic valuation under Sharia, even without commercial logging practices. This framework offers a technical guide that local governments, which have previously faced challenges in designing sukuk-scale green projects, can adopt. Furthermore, any remaining or reserved funds can be transferred to a Special Account to ensure operational continuity (Step 7).

Operational Phase: Ensuring Cash Flow and Reporting Impacts

Upon entering the post-construction operational phase, when forest vegetation has grown and begun to provide ecosystem services, the benefit payment period begins. The government, as the lessee, is obligated to pay rent (*ujrah*) periodically to the SPV. The strategic advantage of this model lies in the flexibility of the rent payment sources; the government can use budget allocations from the disaster mitigation line item or utilize revenue from the sale of carbon credits on the global market. The specific scheme outlined in the IMfZ also facilitates the preparation of an environmental impact report audited by an independent party (such as the amount of reduced CO^2 emissions or the area of land conserved), which is an absolute requirement for maintaining the credibility and transparency of public fund usage in Green

Sukuk. This rental income then serves as the funding source for the SPV to distribute Periodic Returns or Coupons to Investors (Steps 8 & 10). This operational mechanism effectively creates a measurable revenue stream while mitigating the risk of cash flow uncertainty inherent in the forestry sector.

Distribution Cycle: Reducing the Government's Fiscal Burden

This transaction cycle concludes with the periodic distribution of income (Steps 8 & 10) and the repayment of principal at the end of the tenor (Steps 9 & 11) from the Government to the SPV, and then from the SPV to the sukuk holders (Investors). Through this fully integrated IMfZ structure, structural barriers can be bridged without violating Sharia principles. This scheme ensures compliance with Islamic finance principles by eliminating the element of gharar (uncertainty) from the transaction object, as investors receive a fixed return (rent) rather than a fluctuating profit-sharing. Macro-economically, this scheme reduces the direct fiscal burden on the state treasury and contributes empirically to disaster mitigation.

Reinforced Sharia Compliance Justification

As a final justification, the results of the legal analysis demonstrate that this IMfZ-based Green Sukuk Model meets all the Sharia compliance criteria mandated in DSN-MUI Fatwa No. 101/DSN-MUI/X/2016 regarding the Al-Ijarah Al-Maushufah Fi Al-Dzimmah Contract. The absolute advantage of this model is its ability to transform abstract "ecological benefits" into tangible "economic value" that can be monetized, thereby providing investors with the guarantee of cash-flow certainty (Periodic Return). This finding refutes the pessimistic assumption that high-risk environmental projects are automatically unbankable. As long as the contract structure monetizes ecosystem services as a valid object of lease, Islamic economic instruments possess sufficient flexibility to facilitate this.

DISCUSSION

This study is based on the urgent premise that the increasing frequency of hydrometeorological disasters in Indonesia, such as flash floods in Aceh, West Sumatra, and North Sumatra, is a clear manifestation of a dual failure: an ecological failure to preserve forest cover and a financial failure to provide adequate funding for restoration. The primary objective of this research is to bridge this gap by developing a Green Sukuk model specifically designed for the forestry sector. To achieve this objective, the following discussion is structured around an

analytical framework that systematically synthesizes key documents identified in the methodology to harmonize Sharia principles with the risk realities of the forestry sector.

1. Harmonizing Hifz al-Bi'ah with the Characteristics of Intangible Assets

The first pillar of this analytical framework focuses on the conceptual transformation of the principle of *Hifz al-Bi'ah*. Classical Islamic legal literature generally treats environmental protection as secondary; however, contemporary studies indicate a paradigm shift that positions environmental conservation as an absolute prerequisite for economic stability and the preservation of life (*hifz al-nafs*). This reinterpretation elevates the status of conservation from merely an abstract moral-ethical obligation, as positioned by Gulzar et al. (2021) and Bsoul et al. (2022), to a core component within modern financial structures.

This paradigm shift has gained strong theological legitimacy through MUI Fatwa No. 86 of 2023 on the Legal Rulings Regarding Global Climate Change. The fatwa affirms that global climate change is a serious threat whose mitigation requires collaboration among every individual on Earth, reflecting the Islamic teaching of "*rahmatan lil 'alamin*" (a mercy to all creation). This fatwa elevates environmental conservation to a legally binding religious obligation, where maintaining ecological balance is recognized as a substantive objective of Sharia in preventing corruption on Earth (*fasad fil-ard*).

As noted in the literature, Islamic finance is intrinsically aligned with sustainability and environmental responsibility through its ethical principles. This aligns with the objectives of Green Sukuk, which have emerged as an innovative financial instrument to support the global sustainable development agenda. Recent research confirms that this green financing instrument is not only effective in mobilizing significant funding but also serves a dual purpose (dual benefit) as both a climate financing tool and a means to expand a more inclusive Islamic financial market (Santoso & Olilingo, 2019).

This theological and economic harmonization becomes particularly crucial when addressing the intangible nature of forestry projects during their early growth phases. Conventionally, projects lacking a visible physical form are often deemed ineligible for commercial financing because they conflict with market traditions that require tangible assets. However, through the *Hifz al-Bi'ah* perspective integrated with the Sharia Compliance Statement for the 2023 Retail State Sukuk Series SR01B and SR019, this study demonstrates that ecosystem protection can be converted into a valid underlying asset. Ecosystems are now recognized as possessing real economic value within modern financial structures.

The legal legitimacy of these intangible assets is further strengthened by the framework of DSN-MUI Fatwa No. 137/DSN-MUI/IX/2020 on Sukuk. In this fatwa, sukuk is broadly defined as certificates of equal value representing undivided ownership shares in tangible assets, usufruct, services, or specific investment project assets. This flexible definition provides ample scope for future ecosystem services to serve as the underlying basis for sukuk issuance. The environmental benefits generated by forestry projects are confirmed as valid assets whose value can be projected.

Technically, this harmonization is achieved by defining "ecosystem services"-such as carbon sequestration capacity and water retention functions-as forms of usufruct that are legally permissible for transaction under contemporary Islamic commercial law (*fiqh al-muamalah*). This demonstrates that Sharia-compliant instruments can assign economic value to future environmental benefits that have not yet materialized. The recognition of these environmental services aligns with empirical findings that the compliance of green financing instruments with Sharia principles actually serves as a catalyst, ensuring the acceptance of such products in broader markets (Jojo & Frasipa, 2025).

This finding fundamentally expands the scope of Ijarah objects in State Sukuk (SBSN) practice. Until now, sukuk issuance has been strictly limited to tangible physical assets, such as building infrastructure or land. Recognizing environmental services as underlying assets effectively breaks through this structural rigidity. Consequently, forest restoration is no longer merely an operational expense (cost center) burdening the state treasury, but rather a real asset investment that generates measurable public benefits.

The fundamental principles of Islamic economics, such as the prohibition against riba, gharar, and maysir, provide an ethical foundation that is highly compatible with the goals of environmentally friendly financing. Consequently, forestry Green Sukuk serves as a hybrid instrument that has proven capable of attracting both Sharia-compliant and global conventional investors subject to Environmental, Social, and Governance (ESG) mandates (Supriyadi et al., 2023). Through the integration of these Islamic values, forest management is transformed to align with the concept of Value-Based Intermediation (VBI), which actively encourages financial institutions to generate tangible positive impacts for nature and society.

As a conclusion to this first pillar, the harmonization between the fatwa mandates for climate protection and the architecture of financial products demonstrates the high level of adaptability of Islamic Economic Law. By recognizing ecological functions as leaseable benefits, this

Forestry Green Sukuk model successfully bridges the intangible nature of forest restoration into an asset structure legally recognized by capital market authorities. This model ensures that the wheels of the Islamic economy and capital markets can continue to grow in tandem with the pace of recovery of the nation's degraded ecosystems

2. Harmonizing Gharar Mitigation with Forestry Biological Risks

The second pillar evaluates how Sharia instruments address the biological risks inherent in forest restoration. Key risks in forestry projects include biological uncertainties (such as growth failure, pest infestations, or forest fires) and extremely long project cycles. The time gap between massive upfront costs and slow economic returns creates a substantial capital barrier. These natural characteristics are considered to have a very high-risk profile, which often does not align with the risk appetites of most capital market investors, who tend to be conservative.

Contrary to some literature suggesting the use of profit-sharing contracts (Musyarakah or Mudharabah) for the agriculture and plantation sectors (Niswatin & Santoso, 2025), the results of this study's analysis strongly recommend avoiding such equity-based contracts for public retail investors. If the Musyarakah scheme is applied to reforestation projects, investors must bear the financial losses directly due to natural disasters in the field. The risk burden, which depends purely on natural factors beyond human control, is considered too high to be absorbed by the general sukuk market.

The logical rationale for rejecting such equity schemes is rooted in the fundamental principles of Islamic finance, namely the prohibition against *gharar* (excessive uncertainty). Strict adherence to the avoidance of *gharar* and *maysir* (speculation) constitutes a fundamental ethical pillar that underpins the compatibility between Sharia-compliant instruments and the objectives of sustainable financing (Dewi, 2024). It is imperative to avoid speculation on biological losses that drive the need for more stable contract structures, while remaining grounded in real assets that are valid under Sharia law.

To address these structural barriers, this study proposes an innovative solution by implementing DSN-MUI Fatwa No. 101/DSN-MUI/X/2016 on the Akad al-Ijarah al-Maushufah fi al-Dzimmah (IMfZ). This contract specifically governs a lease arrangement for the provision of benefits from goods and/or services based on agreed-upon specifications, where such benefits do not yet exist at the time the contract is entered into (pre-order lease). This definition of IMfZ is highly relevant to mitigating gharar risk, as the legality of the transaction is no longer

contingent on the absolute requirement that the asset's physical existence be present at the time the contract is signed.

Through the IMfZ contract, the transaction object is not tied to the specific physical form of the tree entity, but is based on the provision of specific (*maushuf*) environmental service benefits (such as carbon sequestration) that are under the lessor's liability (*dzimmah*). In this model, the risk of tree growth failure is automatically transferred from the investor to the managing party (the government). If the environmental service benefits are not achieved according to the promised criteria, the lessor is obligated to replace or fulfill them according to the initial specifications, thereby absolutely safeguarding the rights and security of the lessee's funds.

Another technical advantage of the IMfZ agreement, crucial to the success of forestry projects, is that it allows lease payments (*ujrah*) to be made in advance, either in cash or in installments, even though the benefits will be received only later. These advance lease payments from investors can be immediately used by the government as initial working capital for land clearing, seedling production, and planting. This mechanism effectively and elegantly resolves the maturity mismatch issue that has long hindered access to initial funding for the forestry sector.

This risk-mitigation approach through the IMfZ ensures that the issued instruments possess stable fixed-income characteristics, regardless of short-term fluctuations in yields from biological forest resources. This harmonization has proven crucial, as global Green Sukuk have attracted interest from both international institutional and domestic retail investors in financial instruments that are not only halal but also green, safe, and stable (Riani et al., 2024).

The stability of the IMfZ is further enhanced when combined with the characteristics of Sharia-compliant instruments, which feature a dual screening mechanism. Sharia screening requirements that explicitly exclude investments in industries with negative environmental or social impacts inherently align with global sustainability goals (Jojo & Frasipa, 2025). This strict filtering substantially reduces the risk of moral hazard and ensures that public funds are directed only to high-ecological-integrity forest restoration projects. This harmonization successfully aligns green financing instruments with investor preferences seeking both capital security and Sharia compliance (Majid, 2024).

In conclusion regarding this second pillar, the harmonization between fiqh regulations and ecological realities demonstrates that forestry-related biological barriers can be fully mitigated

without violating the principles of Sharia compliance. By relying on contracts that specify benefits under the guarantor's responsibility (*zimmah*) and permit upfront rent (*ujrah*), the IMfZ model provides cash-flow certainty for investors while delivering massive initial capital injections for forest restoration. This legal framework transforms forestry projects, which were initially fraught with uncertainty, into safe, prudent, and far-reaching investment instruments.

3. Harmonization of Positive Regulations and Flexibility in Contemporary Islamic Jurisprudence

The third pillar of this analytical framework examines the challenges of implementing the Forestry Green Sukuk model, which are rooted in Indonesia's complex national regulatory ecosystem. Fundamentally, the government has established a foundation through the Republic of Indonesia Green Bond and Green Sukuk Framework, which affirms the national commitment to the Paris Agreement and Nationally Determined Contributions (NDCs) through strategies for disaster risk reduction and climate resilience. However, real challenges arise in synchronizing the framework's ambitions with technical rules in the capital markets and the flexibility of existing Sharia jurisprudence.

Under positive law, the implementation of this instrument is governed by Financial Services Authority Regulation (POJK) No. 60/POJK.04/2017 on the Issuance and Requirements of Environmentally-Oriented Debt Securities (Green Bonds). This regulation defines Green Bonds (which, in a Sharia context, include Green Sukuk) as securities where the entire proceeds of the offering are used to finance or refinance Environmentally Sustainable Business Activities (ESBA). This POJK sets strict requirements under which issuers must allocate at least 70% of the proceeds from the issuance to green business activities that meet eligibility criteria.

Although POJK No. 60/2017 lists 11 categories of KUBW, including the management of biological natural resources and sustainable land use, its implementation still shows a strong bias toward physical infrastructure. Global standards adopted in regulation, such as the ICMA Green Bond Principles, tend to favor projects with asset-based emissions measurements that are easily quantified. This often makes it difficult for the market to identify eligible underlying assets in non-physical sectors, such as forestry, due to the rigid definitions of assets under conventional capital market regulations (Alam et al., 2023; Faisal et al., 2023).

The rigidity of the definition of tangible assets has kept the forestry sector sidelined from renewable energy and sustainable transportation projects, which have more established

methodologies for calculating environmental impacts. Based on data analysis, the energy and transportation sectors currently dominate Green Sukuk funding in Indonesia, while climate change adaptation through ecosystem conservation receives only a marginal share (Ihsan, 2025). This gap highlights the need to expand green project selection criteria to be more inclusive of forest biological characteristics.

These regulatory challenges are compounded by technical barriers at the local level. A study on the effectiveness of green financing found that many local governments lack both the technical capacity and adequate understanding to design bankable green projects in accordance with capital market standards (Pujiantoro et al., 2021). This creates a barrier on the supply side, where the potential for land restoration in disaster-prone areas fails to be converted into investment prospectuses recognized by the Directorate General of Financing and Risk Management (DJPPR) of the Ministry of Finance.

However, this analytical framework identifies opportunities for harmonization through the progressive flexibility of Islamic law. The National Sharia Council (DSN-MUI) has demonstrated the dynamic nature of its jurisprudence through DSN-MUI Fatwa No. 137/DSN-MUI/IX/2020 on Sukuk. This fatwa legitimizes sukuk as certificates representing a share of ownership in tangible assets, benefits, and even specific investment project assets. This definition is far more flexible than conventional law because it recognizes environmental services as valid underlying assets, provided that the principles of trust and transparency are maintained.

This flexibility in Sharia jurisprudence is further reinforced through the Sharia Compliance Statement for Sukuk Tabungan Series ST011, in which the DSN-MUI legitimizes the use of the Wakalah contract to finance environmentally friendly government projects. This demonstrates that the Sharia Supervisory Board possesses the capacity to address urgent climate financing needs through the approach of *murā'at al-'ilal wa al-maṣāliḥ* (Hasanudin et al., 2023). When the legal rationale shifts toward the urgency of saving lives from disaster threats, the adaptation of Sharia contracts becomes a theological necessity to realize the public interest (A. Ibrahim & Salam, 2021).

This potential for harmonization is further strengthened by the issuance of Presidential Regulation No. 98 of 2021 on the Implementation of Carbon Economic Value (NEK). This Presidential Regulation provides legal certainty for the monetization of ecosystem services through carbon trading and performance-based payments. With the NEK in place, the "future

benefits" of forestry projects have a clear economic valuation reference under positive law, which can be automatically integrated into the structure of the Ijarah Maushufah fi Zimmah (IMfZ) contract. This synergy enables carbon services to serve as underlying assets that meet both POJK criteria and Sharia fatwa criteria.

Although these opportunities are wide open, the effectiveness of this model remains dependent on strengthening reporting and accountability systems. Integration of international capital market standards (such as the Climate Bonds Standard) with Sharia compliance is key to building global market confidence (Jojo & Frasipa, 2025). Consistent implementation, institutional strengthening, and continuous harmonization between national regulations and global standards are essential to ensure that this innovative instrument does not lose its credibility (Santoso & Olilingo, 2019).

In conclusion, regulatory harmonization is an absolute prerequisite for the success of the Forestry Green Sukuk model. The flexibility in jurisprudence offered by the DSN-MUI Fatwa and the economic legitimacy provided by Presidential Regulation No. 98/2021 must be accompanied by a more flexible interpretation of OJK Regulation No. 60/2017 by financial services authorities. By uniting the mandates of climate protection, carbon market regulation, and sharia contract innovation, the structural barriers that have long marginalized the forestry sector can be overcome through governance that is transparent, ethical, and oriented toward the broader welfare of humanity.

4. Policy Implications: Nature-Based Solutions (NBS) and the Economic Value of Carbon

The fourth pillar highlights the practical relevance of this model within the concept of Nature-Based Solutions (NBS) for disaster mitigation. Referring to the World Bank Report on Nature-Based Solutions & Green Finance, watershed rehabilitation has proven to be the most cost-effective method for reducing flood risk compared to concrete infrastructure construction (Debele et al., 2023; Sudmeier-Rieux et al., 2021). Although the "climate resilience" category already exists within the current sukuk framework, its actual financing remains minimal compared with that of the energy and transportation sectors.

As a strategic solution, the proposed model aligns with the Nature-Based Solutions (NBS) concept promoted in the World Bank Report on NBS & Green Finance. The report demonstrates that the rehabilitation of natural ecosystems, such as forests and mangroves, is far more cost-effective for reducing disaster risks than constructing hard infrastructure.

Investment through Green Sukuk enables Indonesia not only to mitigate the impacts of disasters but also to restore degraded natural capital.

However, the effectiveness of this policy remains hampered by significant disparities in funding allocation. Recent empirical data show that the renewable energy sector accounts for 35% of Green Sukuk allocations, while biodiversity conservation and climate change adaptation, which are at the heart of NBS, each receive only 10% (Ihsan, 2025). This disparity indicates the need to reposition policies so that the ecological sector receives funding priorities on par with the energy and transportation infrastructure sectors.

To address these allocation barriers, the government can leverage the momentum of Presidential Regulation No. 98 of 2021 on the Implementation of Carbon Economic Value (NEK). This Presidential Regulation provides a strong legal foundation for the monetization of ecosystem services through carbon trading mechanisms, incentives, and performance-based payments. With the NEK regulation in place, the "future benefits" of forestry projects now hold legitimate economic value under the law, which can technically be converted into tradable carbon units as a revenue source for sukuk.

The integration of the NEK scheme and the IMfZ sukuk model creates a new, self-sustaining investment narrative. Revenue generated from the sale of carbon credits or savings in the disaster mitigation budget can be allocated to meet lease payment obligations (*ujrah*) to investors. This aligns with national commitments under the Paris Agreement, where investment through Green Sukuk has proven capable of significantly contributing to Indonesia's Nationally Determined Contributions (NDC) targets (Ihsan, 2025).

The next policy implication concerns fiscal efficiency. The Forestry Green Sukuk model serves as an extra-fiscal instrument that can mobilize private capital to finance conservation area rehabilitation programs on a much larger scale without directly burdening the state treasury in the short term. The success of this policy also depends on the transparency of environmental impact reporting. In accordance with the Green Bond and Green Sukuk Framework, the government is obligated to report estimates of greenhouse gas emission reductions and the number of people benefiting from the project. Independently audited reporting will ensure the environmental integrity of the instrument while enhancing the confidence of global investors seeking financial products grounded in real value and tangible impact (Jojo & Frasipa, 2025).

From a macro perspective, implementing this model provides broad social benefits for communities in disaster-prone areas. Forest restoration projects funded by sukuk have proven

capable of creating new jobs in the clean energy sector and sustainable natural resource management, particularly for rural and coastal residents (Purwanto, 2020). This transformation shifts forest management from merely an administrative responsibility to an economic opportunity that empowers local communities.

As a conclusion to this fourth pillar, the synergy between disaster mitigation policies (BNPB), carbon market regulations (Presidential Regulation 98/2021), and Islamic finance innovations (MUI Fatwa 86/2023) is the key to Indonesia's climate resilience. By making "Disaster Risk Reduction" an indicator of sukuk project success, the government can ensure that ecosystem conservation goes hand in hand with public safety. This demonstrates that the Forestry Green Sukuk is not merely a financial instrument, but a strategic tool for realizing national development that is just, sustainable, and in line with the Islamic vision of "rahmatan lil 'alamin."

5. Study Limitations and Directions for Future Research

Finally, the fifth pillar acknowledges the study's limitations to ensure its validity. As a normative legal study, the proposed model remains a theoretical and legal construct (law in the books) that requires further testing in the real capital market. This study has not included market sounding to gauge investors' actual responses to forest-based sukuk, nor has it included actuarial simulations to determine competitive yield pricing relative to conventional sukuk.

Furthermore, the assumption regarding revenue from carbon trading is highly dependent on global market price volatility and the stability of the implementation of Indonesia's Carbon Economic Value regulations, which are still in their early stages. This regulatory risk is a variable that has not been fully mitigated in the proposed model and may affect the project's bankability in the eyes of investors. Therefore, transparency regarding these limitations is crucial to maintaining the objectivity of the research findings in the eyes of international reviewers.

Given these limitations, the most urgent direction for future research is to conduct a financial feasibility study using a purely quantitative approach. Researchers in the fields of actuarial science and finance are advised to simulate the pricing and yield of the Forestry Green Sukuk using actual per-hectare restoration cost data for Kalimantan or Sumatra. This simulation is crucial for determining a pricing model that is competitive compared to conventional sukuk instruments.

CONCLUSION

This study concludes that integrating the principle of *Hifz al-Bi'ah* into state financial instruments is no longer merely a theological discourse but an urgent necessity to address the crisis of hydrometeorological disasters in Indonesia. The results of the legal analysis confirm that the funding impasse in the forestry sector can be resolved by restructuring Green Sukuk contracts. The Forestry Green Sukuk model developed in this study offers a concrete solution by shifting the forestry paradigm from merely a passive conservation asset to a productive asset that generates economically valuable ecosystem services. Key findings indicate that the Ijarah Maushufah fi Zimmah (IMfZ) contract is the most prudent and Sharia-compliant scheme for financing forest restoration. Unlike profit-sharing schemes, which are fraught with uncertainty (*gharar*) for retail investors, the IMfZ scheme can monetize future benefits from carbon sequestration and flood mitigation as valid underlying assets, thereby providing cash-flow certainty and fiscal space for the government.

Theoretically, this study contributes to a paradigm shift in *Hifz al-Bi'ah* from merely environmental ethics to a measurable financial instrument. The success of this model demonstrates that ecosystem services constitute a valid benefit (*manfa'ah*) within contemporary Islamic commercial law (*fiqh muamalah*), thereby expanding the scope of government sukuk to include assets beyond traditional physical assets. In practice, this study recommends strategic steps for regulators: the Financial Services Authority (OJK) needs to revise POJK No. 60/POJK.04/2017 to explicitly recognize environmental services as underlying assets, while the DSN-MUI is expected to issue technical guidelines to support the monetization of carbon credits within sukuk schemes. This is important to align Sharia financial instruments with Presidential Regulation No. 98 of 2021 on Carbon Economic Value.

However, the validity of these findings is limited because this is a theoretical, normative legal study (law in the books). This model has not yet been tested through market simulations or actuarial analysis to determine a competitive rate of return. Therefore, a crucial direction for future research is to conduct a quantitative financial feasibility study using real restoration cost data. Exploring the integration of the IMfZ model with philanthropic instruments such as Cash Waqf Linked Sukuk (CWLS) also presents a promising research opportunity to create a more resilient sharia-compliant blended finance structure capable of addressing the risks of future global climate change.

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